october 1952

THE FOUNDRYMEN'S OWN MAGAZINE

American Foundryman

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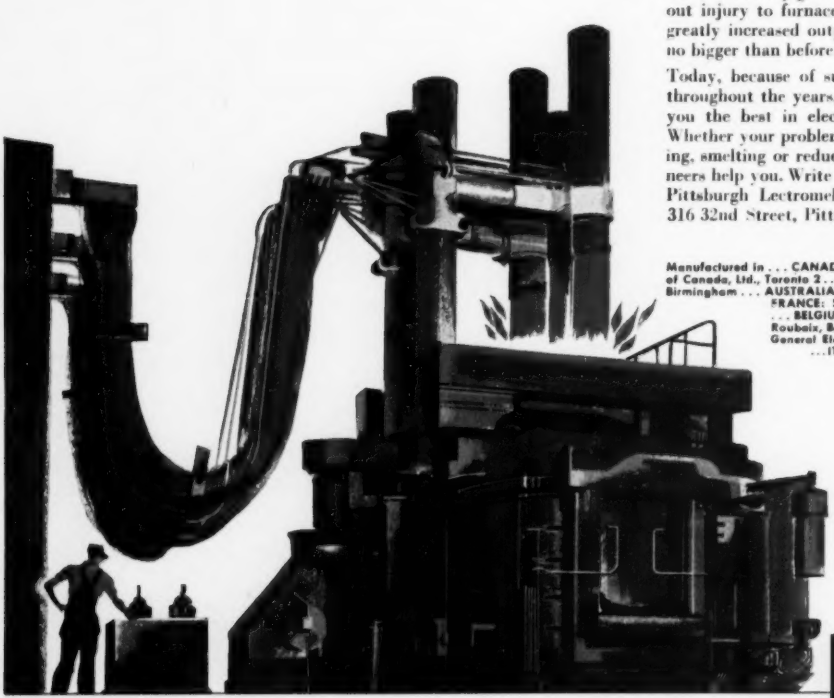
THEY THOUGHT IT COULDN'T BE DONE

but Lectromelt* doubled electric furnace production by doing it!

Other electric furnace designers said it couldn't be done. But Moore, inventor of the Rapid Lectromelt Furnace, dared to boost the power fed to arcs. Production zoomed as power input was pushed up. The day's work was doubled.

Lectromelt heavied up their construction generally, provided larger transformers and power leads, micro-accurate electrode control and more efficient cooling. That's how they got faster melting without injury to furnaces or charges, and greatly increased output from furnaces no bigger than before.

Today, because of such bold thinking throughout the years, Lectromelt offers you the best in electric arc furnaces. Whether your problem is melting, refining, smelting or reduction, let our engineers help you. Write for Bulletin No. 7, Pittsburgh Lectromelt Furnace Corp., 316 32nd Street, Pittsburgh 30, Penna.

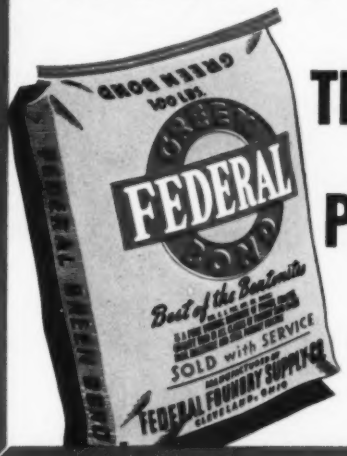


Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

MANY TIMES



THE NATURAL BONDING POWER OF ANY OTHER TYPE OF SAND BOND

Used primarily as an admix to molding and core sands, GREEN BOND is unexcelled in its ability to develop and control green bond strength. Tests show that it has from six to ten times the bond strength of the clays found in most natural molding sands. It produces high green and dry strength in sharp sands even when comprising but ½% to ¾% of the entire mixture, yet molds disintegrate readily at the shakeout. GREEN BOND coats the individual grains of sand as completely as core oils coat core sands, therefore does not clog the voids. Bond is thus established at the points of contact of the grains and the sand is left properly porous and permeable.

There are many other advantages connected with the use of GREEN BOND which, of course, you'll never obtain unless you try it.

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The **FEDERAL FOUNDRY SUPPLY** *Company*

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CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA • DETROIT • MILWAUKEE • NEW YORK • RICHMOND • ST. LOUIS • LOS ANGELES • UPTON, WYO.
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CANADA—Overseas Commodities Ltd., 3840 Grandview Hgy., Vancouver, B.C. • T. D. Barnes, 39 Sun Life Bldg., Hamilton, Ont. • Newman Foundry Supply, Ltd., 643 St. Paul St. W., Montreal, Que. European Concessionaires: The District Chemical Company, Ltd., 1-19 New Oxford St., London W. C. 1, England.

FEDERAL

TO CUT CASTING LOSSES

use

in every melt

Every day, more leading foundries are using Purite *regularly* to cut casting losses and increase production of finished work. In these foundries, the use of Purite is standard operational procedure in every cupola charge. In the ladle too, Purite helps keep production high.

For over 30 years, Purite has been the choice of leading foundries everywhere. Here's why:

1. **Purite produces a higher percentage of finished castings per ton of metal poured.**
2. **Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.**
3. **Purite gets to all the iron quicker.**
4. **Purite is time-tested and proven for unsurpassed desulphurizing uniformity.**
5. **Purite comes in 2-lb. pigs—no weighing or measuring required.**
6. **Purite is 100% pure fused soda ash—you do not pay for inert materials.**
7. **Purite does not crumble—no waste—no dust.**
8. **Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.**

Purite, the scientific flux for better melting and cleaner iron, is sold by all leading foundry supply houses in the United States and Canada. Mathieson Chemical Corporation, Baltimore 3, Maryland.

Mathieson
CHEMICALS

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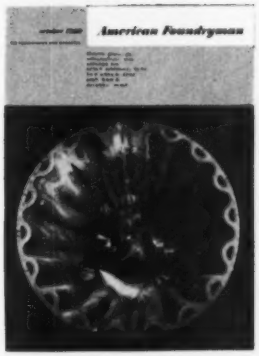
SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

American Foundryman

October 1952 / *Volume 22 • Number 4*
Published by American Foundrymen's Society



Rough treatment and a short life, that has been the lot of the lowly cinder pot in the past. Today, with lower iron content ores and increased use of oxygen, the treatment is rougher than ever. Couple these things with the demand for bigger "thimbles" and you have plenty of foundry problems to solve. The cover picture indicates some of the solutions—corrugated walls, expandible rims, copper-coated bottoms—that are resulting in bigger and better cinder pots. The picture story (on page 53) tells something of how the pots are made at the Midland, Pa., plant of the Mackintosh-Hemphill Co.

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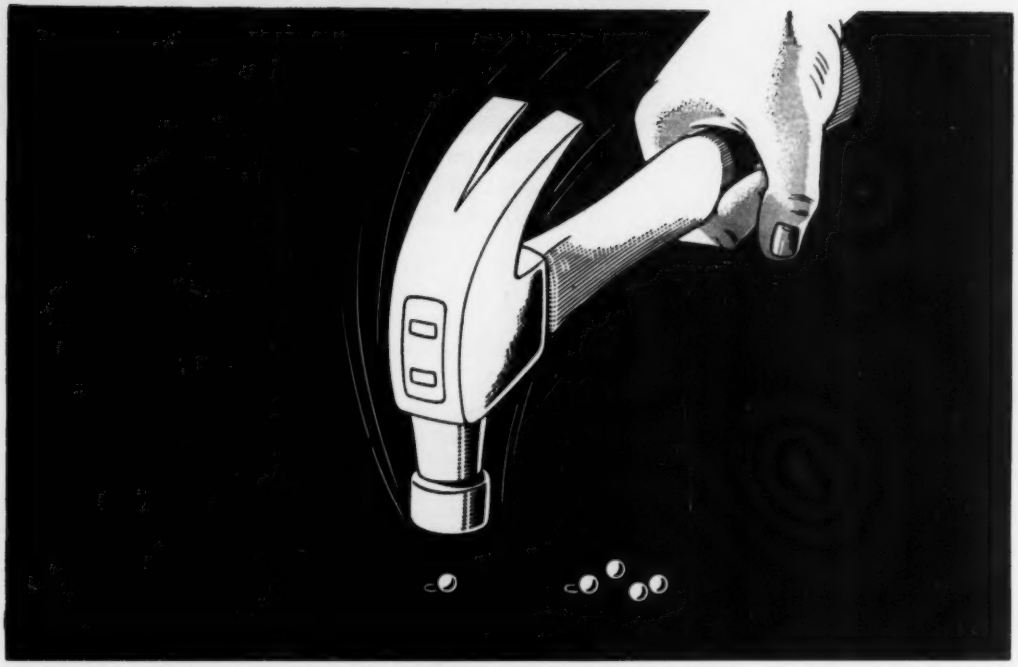

ARE YOU A *Betting Man?*

We would like to bet you a good lunch—that you can't take five pellets of the chilled iron shot you are now using and deform them, no matter how lightly you tap with your hammer. ALL OF THEM WILL SHATTER—NONE OF THEM WILL DEFORM.

Then we'd like to bet you another lunch that you can take five pellets of National Controlled "T" Shot and EVERY ONE OF THEM WILL DEFORM BEFORE TEARING APART.

The significance of these statements is obvious. National Controlled "T" Shot and Grit is the ONLY chilled iron abrasive in which the hard iron carbides (that do the cutting) are imbedded in a *ductile matrix*. Hard? Yes, indeed, hard enough to do a cleaning job as fast or faster, BUT soft enough to go easy on your equipment and to keep the shot from shattering as readily.

As a betting man, we'd like to prove our statements to you. The most you can lose is a lunch. And if we're telling the truth, you can gain substantial savings in your cleaning operations. What we suggest is such a quick and simple test, you can make it in a matter of minutes. Incidentally, if your blastcleaning operation requires the use of grit you will not be able to make this test—but remember, grit is made from shot, and a ductile matrix is even more important to a grit user, from a standpoint of holding down maintenance costs. Please write your name and address on the coupon below and mail it to the nearest Hickman-Williams office, and let us show you something *different* in chilled iron shot and grit.

NATIONAL CONTROLLED "T" SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*
NATIONAL METAL ABRASIVE COMPANY • CLEVELAND, OHIO
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OK. Let's see you prove your point . . .

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PENN SAND

SILICA FLOUR

it makes sense . . . use the best AT NO EXTRA COST

The excellent refractoriness of PENN SAND Silica Flour reduces metal penetration, minimizes surface defects and produces castings of exceptionally smooth finish. In your mold wash, you will find that constantly uniform PENN SAND Silica Flour gives the same suspension and thickness of application every time; you always get the same even coating. ● Its high fusion point and perfect uniformity also make PENN SAND Silica Flour ideally suited as an admixture to your mold and core sands. Supplied by the country's leading producer of quality silica products, PENN SAND Silica Flour is available for immediate shipment to you in a complete range of grades. ● It makes sense to use the best silica flour when it costs no more. Write today for free samples—and on your next order be sure to specify PENN SAND Silica Flour, the most economical material for mold wash.

PENNSYLVANIA PULVERIZING COMPANY

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Coming to help you

solve problems in design and production!

"BRINGING the mountain to Mohamet might best describe Dow Corning Corp.'s traveling exhibit . . . Free standing panels . . . separate the exhibit into nine bays, each emphasizing a property of silicones and showing where that property brings a benefit to an actual end product or operating unit . . ."
INDUSTRIAL MARKETING (June 1952)

"NEXT TO THE GREATEST SHOW ON EARTH . . . We could go on . . . reciting the fantastic properties of Silicones, but just as breathtaking as the materials were the display techniques used to demonstrate them . . ."
CIRCUIT RIDER (Vol. 6, No. 2, published by Electrical Construction and Maintenance)

". . . Heat Stability Plus: Visitors . . . see, among other demonstrations, how Silastic (Dow Corning's silicone rubber) remains soft and flexible at temperatures far above the limits of organic rubber . . ."
CHEMICAL WEEK (Jan. 26, 1952)

"IF YOU HAVEN'T already seen it, don't miss it when it comes around . . ."
POWER ENGINEERING (May 1952)

DOW CORNING SILICONES . . . are no longer a mystery or a "future possibility" to the 17,000 executives and engineers, representing more than 4600 plants, who have already seen the Dow Corning Silicone Exposition.*

They learned that silicones are fluids and resins that keep clothes and shoes and brick walls dry in the rain. They're fluids that polish without rubbing.

They're rubber that won't melt on hot aircraft engine cylinders or freeze on switches that operate bomb bay doors at 100° below zero.

They're electrical insulating resins and varnishes that double the power of electric motors, or multiply by 10 the life of electric machines.

They're paints that protect metal at 1000°F. They're foam killers and release agents. They're a whole family of new engineering materials that can help you to improve your product or to cut production costs.

*In Boston • Chicago • Cleveland • Dayton Detroit • Fort Worth • Houston Indianapolis • Los Angeles • New York Philadelphia • Pittsburgh • Seattle Washington, D.C. • or Wichita.

DON'T MISS IT

MAIL THIS COUPON TODAY

Dow Corning Corporation, Dept. AV-22 Midland, Michigan

Kindly include me among your guests at the private showing of the Dow Corning Silicone Exposition in

- ☐ St. Louis
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CANADA: Fiberglas Canada Ltd., 1200 Bay St., Toronto, Ontario
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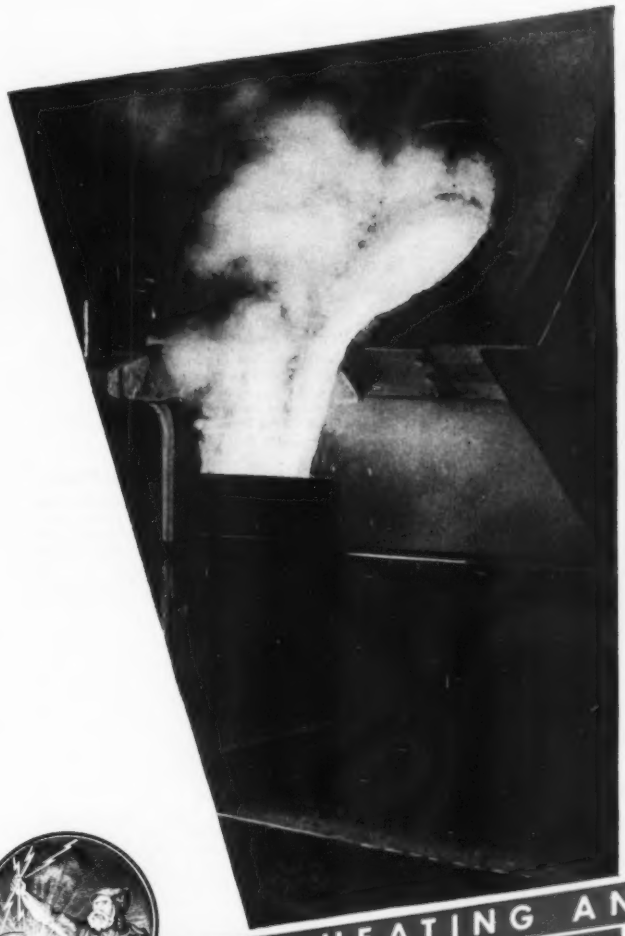
Alloy savings

PAY FOR AJAX-NORTHRUP FURNACES

in three years



Induction melting saves tons of ferrochrome a month in one east coast stainless steel foundry . . . metal that was previously "burned up" in other electric furnaces.

With a three shift monthly melting capacity of 1,000,000 pounds, a 2% reduction in chromium losses made the difference. Dollar savings up to $60,000 a year are enough to pay for the equipment in a year and a half—three years on a reduced schedule.

This is only the beginning—savings in other critical and expensive alloys are also appreciable. Here are typical metal recovery figures from another Ajax-Northrup foundry melting 18-8 stainless:

Ni:	100%	Cr:	99%	Mn:	90%
Si:	94%	Mo:	95%	Cb:	92%

Besides saving metals, Ajax-Northrup furnaces melt at high speed, with extremely close control of analysis and temperature. A typical foundry, with never more than one 600-pound furnace in operation on a two shift basis, pours almost 250,000 pounds of high-melting point alloys a month. Pouring temperatures are controlled within 20°F, composition of every element within 0.25%

Performance like this can save critical alloys for you, too. Whether you melt 8 ounces of platinum, or 8 tons of steel, write us today.

SEND FOR NEW INDUCTION HEATING AND MELTING BULLETIN

140

FOR HEATING AND MELTING

AJAX NORTHRUP

AJAX ELECTROTHERMIC CORPORATION

AJAX PARK
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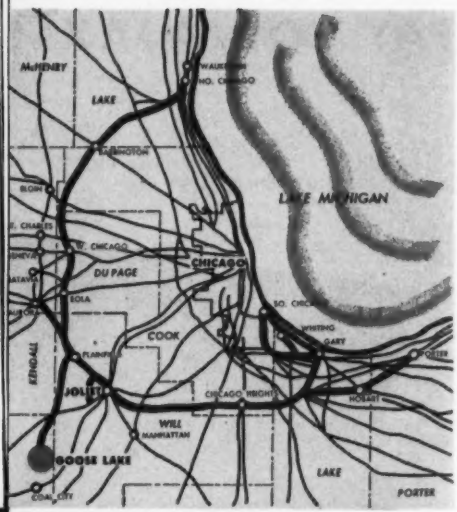
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

ILLINOIS CLAY PRODUCTS HAS ALL 3



1 Central Location

The Illinois Clay Products Company, Goose Lake Plant, is located near Joliet, Illinois—only 55 miles from Chicago. Above is a map showing the excellent shipping facilities provided by the Elgin, Joliet & Eastern Railway—the Outer Belt Line.

2 Ample Supply and Modern Plant

At Goose Lake, extensive deposits assure an ample source of fire clay for many years ahead. This large modern plant employs all the latest methods in the manufacture of refractories and insulation and many advanced and special techniques have enabled us to supply better products than are obtainable elsewhere.

Chem-Brix
Pat. Applied for
CHEMICALLY BONDED REFRACTORIES

GOOSE LAKE
AND CLAYS

3 Quality Products

For over 40 years, Illinois Clay Products Company has maintained high standards in quality and uniformity. Research and development have led to constant improvements and new products such as Carbon and Hi-Silica Chem-Brix.

THERM-O-FLAKE
HIGH TEMPERATURE VERMICULITE INSULATION

Illinois Clay Products Company

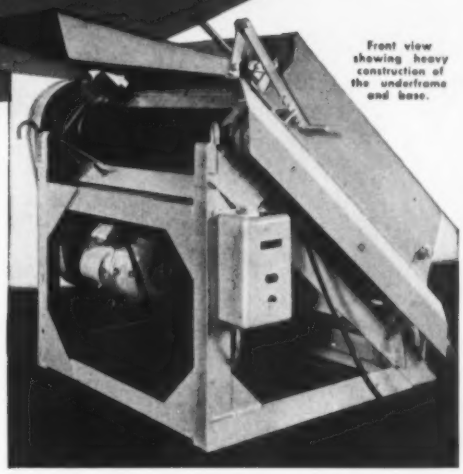
SINCE 1911 JOLIET, ILLINOIS

Rear view—note the unusual expanse of the hopper and combing belt.

UP TO 100 TONS

of prepared sand per hour

with the ROYER "NYS"



Front view showing heavy construction of the underframe and base.

Foundries that have a conditioned sand requirement of 60 tons per hour or more find the new Royer "NYS" ideally suited to their needs. This newest model in the complete Royer line of sand separators and blenders has a capacity of 60 to 100 tons of prepared sand per hour, depending upon the type and temper of the sand.

Specially designed to handle large capacities from big mullers or in sand handling systems, the "NYS" thoroughly blends and mixes; removes refuse; reduces sand to uniform, lump free texture; distributes moisture evenly; increases permeability and double aerates. The finished product is an open, gas-free, evenly textured sand — ready for the molder's use. Sand prepared the Royer way helps to make true-to-pattern molds, greatly reducing rejects and cleaning and grinding time.

Unusually sturdy construction is your assurance of long service life under abusive operating conditions. Investigate the possibilities for this production increasing machine in your foundry. Write today for more information on this labor saving unit.

SPECIFICATIONS

Capacity	60 to 100 tons per hour depending upon type and temper of sand	
Overall Dimensions	Length:	84"
	Width:	56"
	Height:	54"
	Belt Width:	36"
Approximate Weight		2000 pounds
Power		15 horsepower
Construction	Heavy welded angle frame and base	

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 155 PRINGLE ST. KINGSTON, PA.

Link-Belt equipment at Cutler-Hammer foundry includes shakeout screen, bucket elevator, storage bin with vibrating screen (right); transfer belt conveyor, Revivifier and distributing belt conveyor (left).

LINK-BELT mechanization

pays dividends for foundries of all sizes

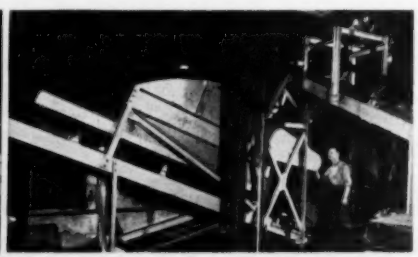
Here's how one important foundry gets fast, clean, low-cost handling of sand and castings

WHETHER your foundry is large or small, mechanized handling of sand and castings offers two big advantages. First, you can produce better castings at lower cost. Equally important, you can make more efficient use of scarce manpower . . . eliminate much backbreak, improve working conditions.

For instance, consider Cutler-Hammer, Inc., Milwaukee. Their new Link-Belt-designed system prepares 15 tons of sand per hour for two stack molding machines. Careful planning has speeded production, provides good housekeeping. Central shakeout simplifies handling and sorting of castings. Despite low headroom, alterations were minor. And provision has been made for expansion.

For information on how mechanization can serve you, call the Link-Belt office near you. A Link-Belt foundry specialist will welcome the opportunity to work with you or your consultant.

Link-Belt Shakeout gives positive separation of sand and castings.



Ram-offs are minimized because sand is thoroughly aerated for easy flowing by Link-Belt Revivifier.

LINK-BELT

Conveyors and Preparation Machinery

•

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,730

MEMBER FEMA

"SO THAT'S WHERE THOSE LITTLE PIGS WENT!"

CHIEF KEOKUK: Sure enough, dear! Thousands of Electro-Silvery pigs were melted down to help make the iron and steel for those skyscrapers . . .

PRINCESS WENATCHEE: . . . and wasn't Electro-Silvery used in making the metal for this boat we're on, and for tanks and tractors and automobiles?

CHIEF KEOKUK: Right! It's hard to find *any* type of product made of iron or steel that *doesn't* use Electro-Silvery!

CHIEF KEOKUK JR: Gosh, Pop, what *is* Electro-Silvery?

CHIEF KEOKUK: Electro-Silvery, son, is a form of ferro-silicon that acts as a vital control element in the production of iron and steel . . .

PRINCESS WENATCHEE: . . . and the world's largest producer of this vital ingredient is the Keokuk Electro-Metals Company!

KEOKUK

ELECTRO-METALS COMPANY

KEOKUK, IOWA

WENATCHEE DIVISION: WENATCHEE, WASHINGTON

Keokuk Electro-Silvery is used by foundries and steel plants in the form of these three pigs, weighing 60 pounds . . . 30 pounds . . . and 12½ pounds.

SALES AGENTS: MILLER AND COMPANY

332 S. Michigan Ave., Chicago 4, Illinois
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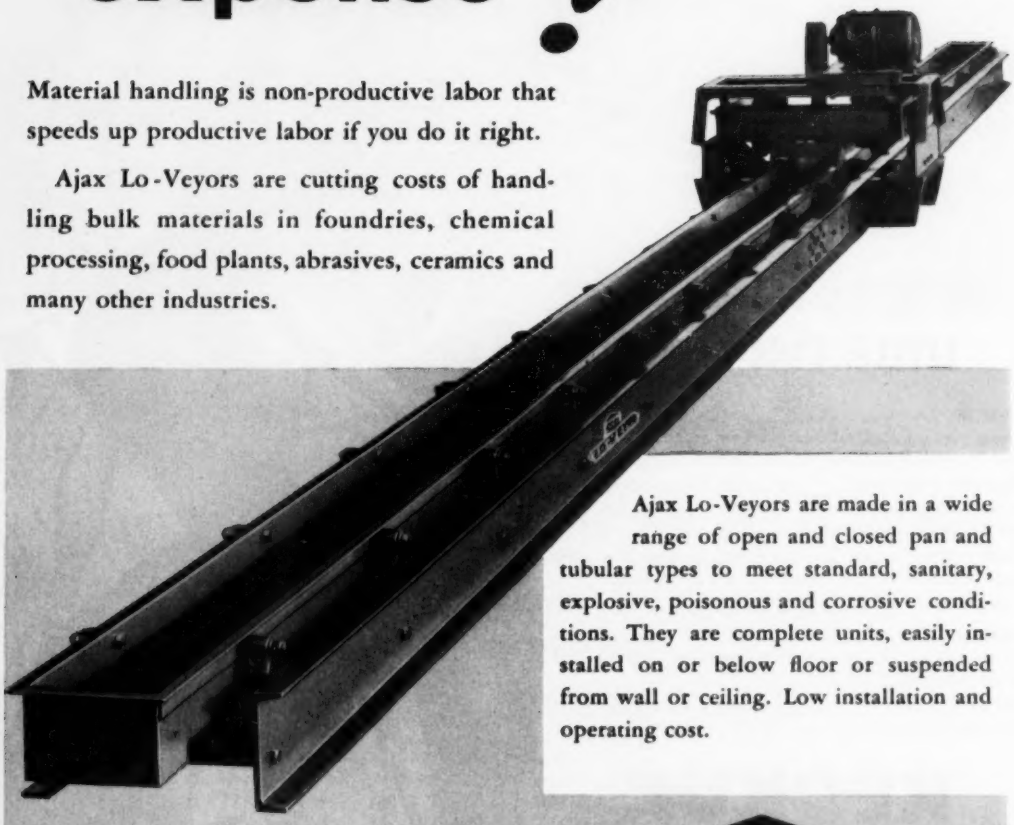
material handling expense ?

Material handling is non-productive labor that speeds up productive labor if you do it right.

Ajax Lo-Veyors are cutting costs of handling bulk materials in foundries, chemical processing, food plants, abrasives, ceramics and many other industries.



Ajax Lo-Veyors are made in a wide range of open and closed pan and tubular types to meet standard, sanitary, explosive, poisonous and corrosive conditions. They are complete units, easily installed on or below floor or suspended from wall or ceiling. Low installation and operating cost.

Write for your personal copy of Bulletin 39

AJAX

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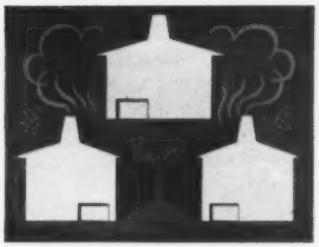
WESTFIELD, N. Y.

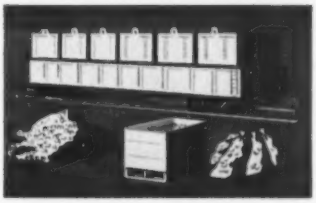
easier to get —

Three plants strategically located with greatly expanded briquetting facilities insure an ample supply



easier to handle—

They're compact and strong. Take a minimum of storage space. Shipped to suit your handling facilities — bulk, bag, box type pallet, by container car, gondola or box car.



easier to work with —

There's no more tedious or uncertain weighing, no more guess work. Simply count out the number you need and toss them in.

OHIO FERRO-ALLOY

FOUNDRY ENGINEERED

BRIQUETS

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FERRO-SILICON - 50 - 65 - 75 - 85 - 90%
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LOS ANGELES AREA—Snyder Foundry Supply Company, Los Angeles 11, California.
MINNEAPOLIS AREA — Foundry Supply Company, Minneapolis, Minnesota.
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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

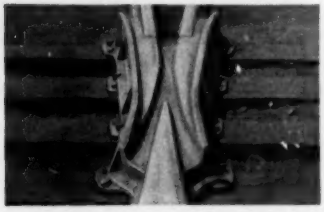

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

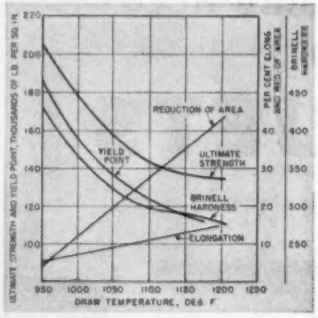

Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. Where greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

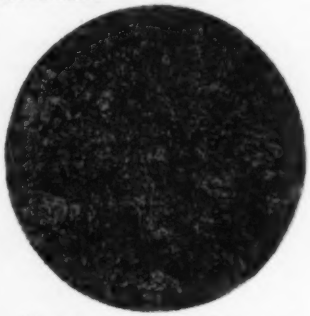

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET's specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

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RESINOX phenolic resins	in liquid form	for core binders
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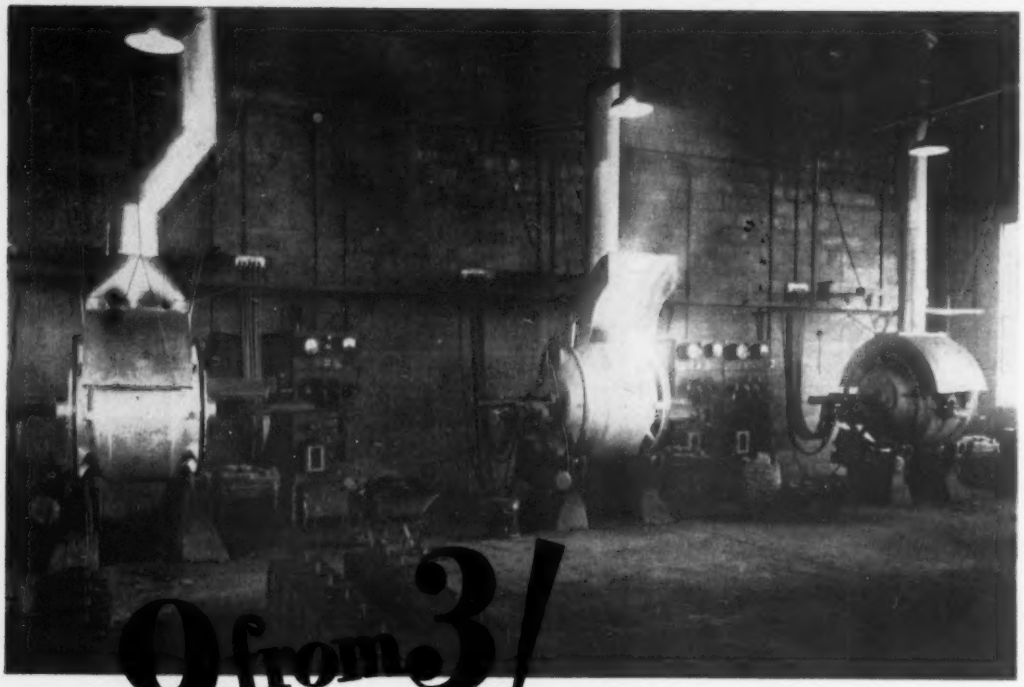

9 from 3!

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Tapping a heat of alloy steel from Detroit Rocking Electric Furnace at Vassar Electroloy Products Co. Furnace is Type LFY, 700 lb., 175 Kw.

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products and processes

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1019 Gas powered lift trucks

Low lift platform truck has been designed to move heavy loads at high speed over long distances. Should be used in well-ventilated areas. Three and five ton capacity models available are end-control, stand-up type trucks, powered with a four cylinder gasoline engine, and two speed transmission. *Elwell-Parker Electric Co.*

1020 Dry lubricant

Synthetic Colloidal Graphite, a dry lubricant, is now marketed in 12 oz aerosol dispensers. It is a slippery, lubricating solid that may be used on conveyors exposed to extremely high or low temperatures in die casting, running-in equipment, etc. *Reynolds Industries, Inc.*

1021 Reverberatory furnace

Long-needed operating improvements for melting of ferrous and non-ferrous metals are now provided by the Eclipse non-crucible, direct-fired reverberatory furnace. Continuous-charge, continuous-pour operation gives high production of quality castings with less time lost between pouring and recharging. Hot metal is always available for casting. Combustion normally wasted is used for melting or preheating cold metal in the hopper which has a restricting opening at bottom to prevent cold metal from contacting the molten metal. Metal is melted quickly with little chance to absorb gases. Fired by oil or gas, it can be built to meet specified requirements. Fuel consumption averages only 55 to 60 gph. Standard models, with bath capacities ranging from 300 to 4400 lb. *Eclipse Fuel Engineering Co.*

1022 Magnetic probe

G-S Magnetic Probe made of super-magnetic alloy is no longer than a fountain pen. Point of magnet is extended or retracted from case by turning end-knob. Strength of magnet can be controlled by amount of extension. Plant first aid stations use probe to remove steel splinters from eyes or skin of employees. Can be sterilized without harming magnet. *General Scientific Equipment Co.*

1023 X-ray inspection unit

Cabinet for assembly line x-ray inspection is fabricated for either radiographic or fluoroscopic inspection of parts. It is designed for straight line or rotary operation. Trays for holding film and parts are moved into cabinet from either end, facilitating x-ray exposures. After each exposure, doors are raised and parts trays are moved into position for next exposure. Cabinet is of all lead-lined metal construction. Pneumatically operated lead-lined sliding doors, afford the operator protection from all radiation. *Bar-Ray Products, Inc.*

1024 Pyrometer

New instrument for industrial or laboratory temperature measurements has a selection of 14 different types of thermocouples and extension arms to meet every surface and sub-surface temperature measuring problem. The PYRO surface pyrometer has a large 4½ in. dial, is shock, dust and moisture-resistant and the shielded steel meter housing is designed to withstand rough usage. Available in five different temperature ranges. *Pyrometer Instrument Co., Inc.*

1025 Dewatering screen

For processing fine materials, new Wedge-Slot screen has twice as much open area as other dewatering screens. Made with stainless steel bars, much smaller than ever previously used in a screen, it is ruggedly built to prevent distortion. Effective for dewatering, drying, screening, filtering. *Hendrick Manufacturing Co.*

1026 Core oven

Greater precision in core strength data is claimed for new large reel-type core oven. Five rotating shelves accommodate up to 120 tensile specimens or five single cores, 4 in. x 9 in. x 23 in. Tray and door design allow easy loading and removal of cores. Temperature variation throughout the oven of less than 4 F coupled with vigorous circulation produces tensile tests usually within five per cent and always less than ten per cent from the average. Furnished complete with a large humidity controller for incoming air and automatic temperature controller-indicator. *Harry W. Dietert Co.*

1027 Lubricators

Oil-Mist lubricators with one-gallon oil reservoirs have built-in automatic warning switches which signal the operator by horn and red light, or shut off the machine as the oil level becomes too low. Units with 12-ounce reservoirs are also available with built-in warning switches. *Stewart-Warner Corp.*

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1001 Air cylinder bulletin

Saving engineers and designers time is keynote of new air cylinder bulletin. The bulletin presents in detail complete engineering design, construction, and mounting data including all mounting drawings and dimensions tables covering 13 different mountings styles in 1½ through 14 bores. Designed so user can quickly select model and obtain dimensions. Sectional cut-away views of cylinders covered include references to exact specifications of the JIC Pneumatic Standards as met by the various design and construction features. *Miller Motor Co.*

1002 Saving melting fuel

Six page report tells how to save melting fuel. This is the fifth of a current series of information folders and tells where to watch for heat losses on the way from melting furnaces to molds and what to do about them. An operation table for a 54 in. ID cupola with fixed blast rate of 5200 cfm is included. *Whiting Corp.*

1003 Shell molding machine

Illustrated bulletin describes standard shell molding machine claimed able to handle 95 per cent of the industry's application. Produces molds with dimensional accuracy of 0.003 in. to 0.005 in. Simplicity of operation, along with an adjustable automatic cycle, completely eliminate the human element from the process of producing molds and permit unskilled operators to maintain peak production with consistant mold quality. Wide range of adjustment in coating and curing phases make machine completely practical for jobbing foundries as well as high production work. Patterns can be changed and a new setup ready to go in an hour or less. Machine is built in two standard sizes to accommodate patterns measuring 20 in. by 30 in. and 26 in. by 41 in. The pattern area can be split two ways or four ways as best suited for the job. *Sutter Products Co.*

1004 Foundry flasks

"How to Select and Maintain Foundry Flasks," a 24-page illustrated booklet, tells how to select the correct type and size of foundry flask for the particular job. Booklet points out that failure to keep flasks in good operating condition can have a marked effect on the quality of castings and foundry losses caused by several types of defects. What to bear in mind when selecting size of flask, depth of cope and amount of sand, correct design, various pin arrangements, general barring of flasks, etc., are some of the suggestions and recommendations set forth in the booklet. *Sterling Wheelbarrow Co.*

1005 Safety shoes

Colorful new catalog gives complete information about Safety First steel-toe shoes. Included are color reproductions and cut-a-way drawings of new styles equipped with air cushioned innersoles of foam latex. Other portions of the catalog contain photographs and facts about the regular line of dress and work shoes. *Safety First Shoe Co.*

1006 Grinding bands

New piece of literature describes Line Grind bands for machining very hard materials such as hardened steels and abrasive and brittle materials such as glass, marble, and granite. Ordering information is given in a convenient chart for bands of different grits and grit sizes. *The DoALL Co.*

1007 X-ray equipment

Seven types of x-ray equipment for industrial application described in four-page folder. Contains pictures of each type with brief description of how each is used. Units described are: 1) single-column tubestand unit, 2) industrial jib crane unit, 3) ultra high-speed radiograph unit, 4) mobile unit, 5) equipment for mass inspection of parts, 6) wall-mounted industrial x-ray unit, 7) thickness gauge, *Westinghouse Electric Corp.*

1008 Sand conditioning

Descriptive data on six components that make up latest addition to line of Simpson mixers and foundry sand handling equipment. Operating and maintenance data, with photos and drawings showing how the new sand conditioning units are installed is included. Cost estimate table enables any foundry to compare cost between new unit and their present method of sand handling and conditioning. *National Engineering Co.*

1009 Shot and grit

"A Primer on the Use of Shot and Grit," examines problems of blast cleaning operations with a view of suiting the abrasive to the finish to be obtained. Aim of primer is to help establish a yardstick against which to measure metal abrasives and to serve as a guide in producing de-

continued on page 104

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See how Allis-Chalmers revolutionary system of drying sand cores dielectrically lowers foundry costs and improves your product.

1. Rapid baking — Takes but a few minutes; provides more production per unit of floor space.
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13. Smoother casting surface.
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Get complete details on the *Foundromatic* Sand Core Dryer. Call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wis.

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QUESTIONS and ANSWERS

About Dielectric Sand Core Drying

Do I need an electronic engineer to help me?

No. Once equipment is installed and operating, any personnel can be quickly trained to follow operating instructions.

How much maintenance is there?

Very little. Periodic oiling of conveyor and blower motors and rollers and replacement of tubes.

Why are resin binders used in place of core oils?

Core oils require high temperatures and long drying time for complete polymerization. Resin binders cure at lower temperatures . . . approximately 250 F.

What about collapsibility?

Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

I want a very hard core, but still want good collapsibility. What do I do?

Spray the cores with a film of moisture just before putting them on conveyor belt. This will give high surface hardness without affecting collapsibility.

Can core rods or nails be used?

Yes. When rods or nails are parallel to electrodes no trouble is encountered. When rods or nails are placed vertically in the core they should be of minimum size in relation to core mass and should not protrude through surface of sand.

Will light sections burn if dried with heavy sections?

No. Cores will not burn in the *Foundromatic* core dryer.

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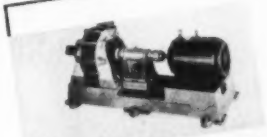

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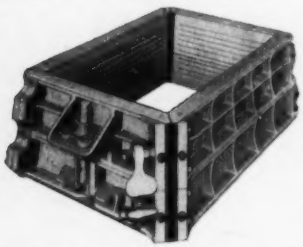

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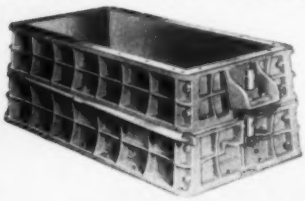

The one-inch **GROOV-LOCK FOOLPROOF PIN**, particularly adapted to cope or drag pattern jobs, guarantees perfect alignment indefinitely. (Other types of standard pin fittings available.) Solid, bolted and welded corner construction.

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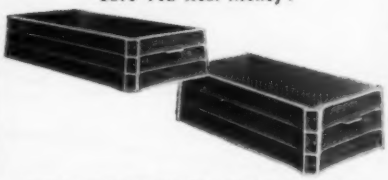

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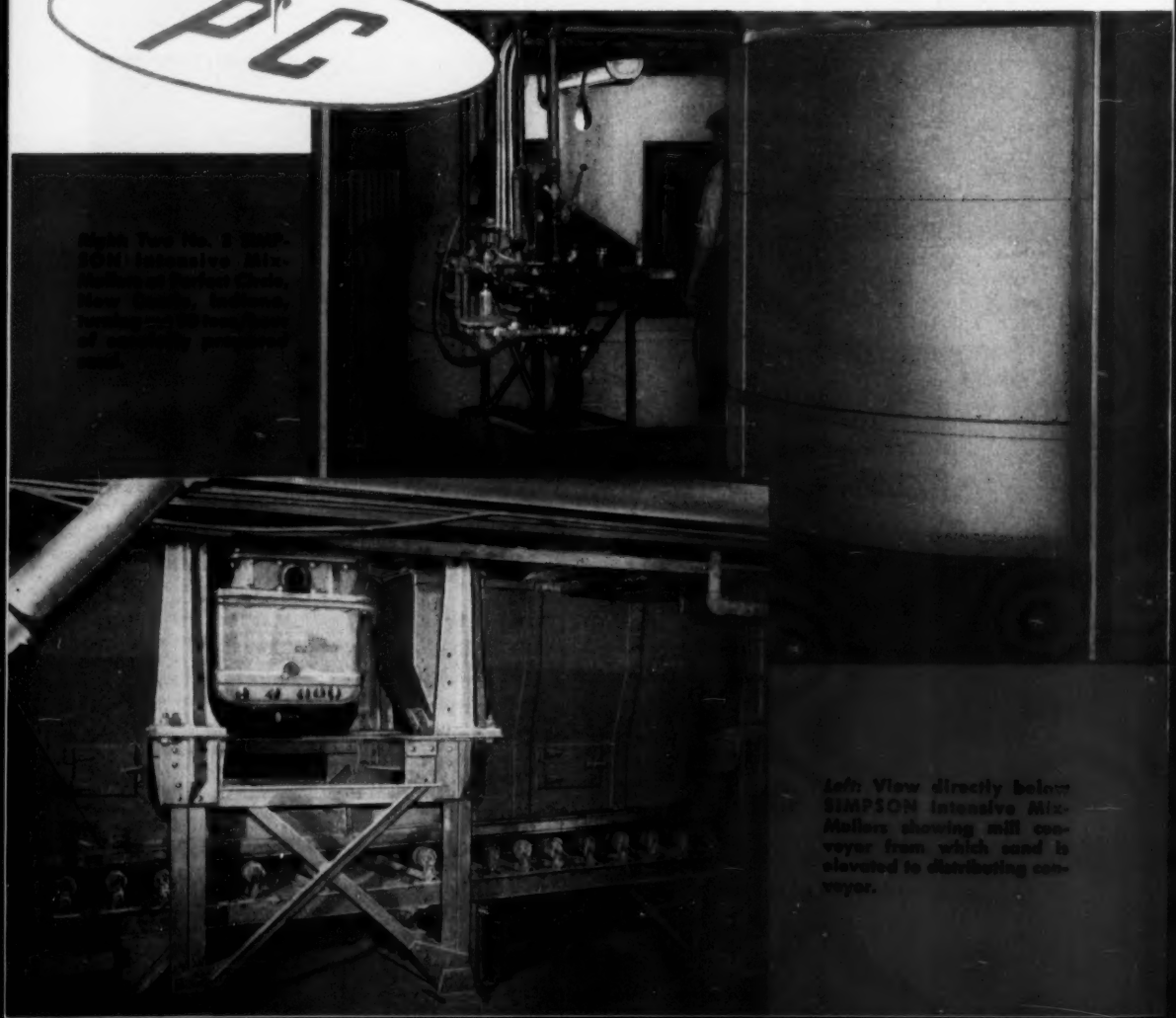
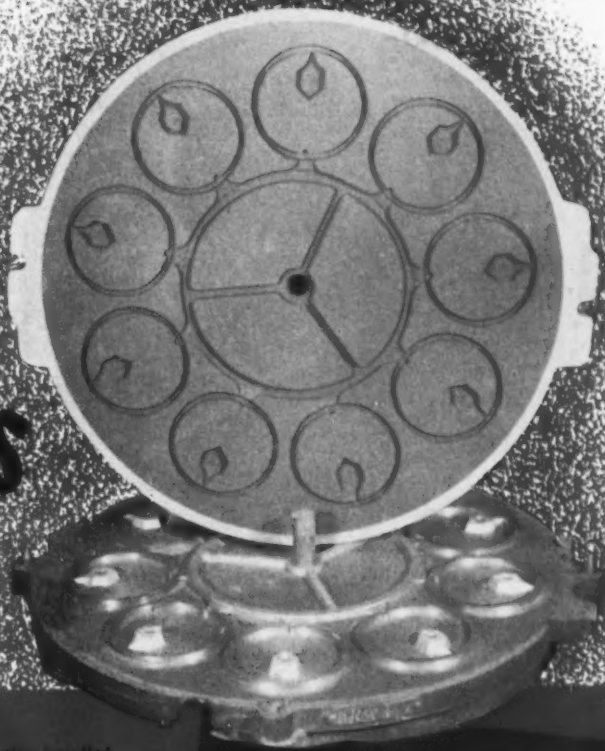


Left: View directly below SIMPSON Intensive Mix-Mullers showing mill conveyor from which sand is elevated to distributing conveyor.

demands Perfect Castings



ELEVEN years ago the Perfect Circle Corporation installed two No. 5 SIMPSON Mix-Mullers at their New Castle, Indiana, foundry. Since the very beginning, these Mullers have consistently produced the high quality of sand so necessary to meet the rigid casting requirements of that company.

The close tolerance, the precision accuracy of Perfect Circle Piston Rings *demand* perfect castings — any defect causes a reject — even minor repairs are impossible.

Smooth, defect-free castings are only possible where molding sand is prepared with utmost care — where each sand grain is evenly coated with bond — where the moisture content is carefully controlled.

At Perfect Circle *production too* must be maintained at a high level. Here again, SIMPSON Mixers have maintained an enviable record . . . 11 years of operation *with no down time due to Mullers.*

Perfect Circle is justly proud of an efficient sand system which is operating now, as it did for 5 critical years during the war . . . 6 days a week, 22 hours a day with less than 0.05% down time per year!

Whether you are casting small piston rings or large manhole covers, the efficiency and speed of your operation — the quality of your finished product, is dependent on the preparation of your sand. Let us show you how you need not sacrifice quality to obtain top production and low maintenance with the rugged SIMPSON Mix-Muller.

Write for bulletin No. 511 on the new 2-F and 3-F *Intensive* Mullers.

Installation Highlights of two SIMPSON Intensive Mix-Mullers at Perfect Circle

- ★ Eleven years of service with no down time due to mullers.
- ★ Operating 22 hours a day 6 days a week for five consecutive years.
- ★ Presently producing 2000 tons of carefully prepared sand per day.
- ★ Only 0.4 percent make-up sand per day.

SIMPSON *Intensive* MIX-MULLERS

NATIONAL *Engineering Company*

600 Machinery Hall Bldg. • Chicago 6, Illinois

Piloted Precision ...from Print to Pattern

Translating precision from your blueprints into patterns is the function of our layout and inspection department. Here skilled hands carefully pilot your patterns through every operation performed on them. The latest methods and the finest equipment are used in this important work. Only through such painstaking layout and inspection can unvarying high quality be maintained . . . and it is on such quality that City Pattern Foundry & Machine Company has built its reputation.

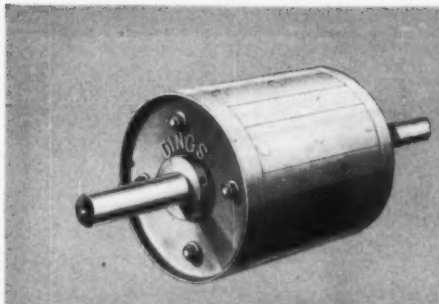
"Piloted precision" is another reason why leading manufacturers rely on City Pattern Foundry & Machine Company for the utmost in accuracy, economy and production utility in wood and metal patterns.

City Pattern Foundry & Machine Company's Shrinkage Conversion Tables save time and eliminate errors in shrinkage calculations. Your letterhead request will bring a set of these handy tables without obligation.

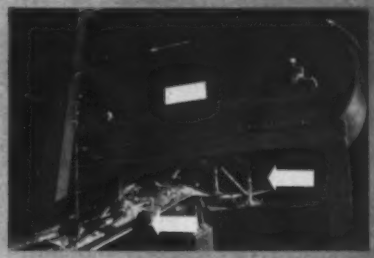
Setting the Pattern in Patterns

CITY PATTERN
FOUNDRY AND MACHINE CO.

3161 HARPER AVENUE • DETROIT 11, MICHIGAN



Dings Non-electric, Permanent Perma-Pulley.



Dings Extra Powerful Self Cleaning Rectangular.

1. 2. 3. 4.

Dings All-Welded Cooler Operating Lifting Magnet.

Dings "Holdtite" holds castings in position for swing grinding.

4 WAYS TO CUT HANDLING COSTS

Compare the advantages these Dings magnets offer over your present methods:

1. THE NON-ELECTRIC, PERMANENT PERMA-PULLEY in the sand handling system takes iron out automatically, without attention, without electricity, without maintenance. Perma-Pulleys have no operating expense, are guaranteed to be permanently magnetic. Magnetic strength is certified.

2. THE SELF CLEANING RECTANGULAR FOR THE TOUGHEST JOBS . . . *another sand handling cost-cutter.* Great power enables this magnet to handle particularly difficult iron extraction jobs. For *maximum* iron removal, none can surpass the Dings Rectangular. Self-cleaning feature makes operation automatic—eliminates "carry-over" of sand with iron.

3. LIFTING MAGNET LIFTS 10 TO 100% MORE. Ideal for handling scrap, pig iron, castings, metal flasks, etc. Lifts more because it's cooler operating. All welded, lightweight, moisture-proof, rugged, 4-point chain suspension.

4. "HOLD-TITE" CUTS GRINDING LABOR COSTS UP TO 25%. Firmly holds all shapes of castings up to 1000 lbs. in position for swing grinding. Magnet can be tilted to 7 different positions. Requires practically no maintenance, simple to install. SEND FOR THIS PAPER: *"Lowering Cleaning Room Costs Through Use of Magnetic Chucks"*. Use coupon below.

If you can use the advantages these magnets offer, NOW is the time to act. Deliveries are still better than average.

Dings

DINGS MAGNETIC SEPARATOR CO.
4708 W. Electric Ave., Milwaukee 46, Wisconsin

SEND THIS COUPON
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Dings: Send me Catalog containing full information on

☐ PERMA-PULLEY ☐ LIFTING MAGNET
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Article on "Lowering cleaning room costs through the use of magnetic chucks" AF

NAME .....
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FOR SURE RESULTS IN MAKING A CASTING, USE

PENOLYN CORE OIL

For Maximum Foundry Efficiency . . . be sure to specify Penolyn Core Oil. There is a grade of Penolyn for every type of casting, to meet the most exacting requirements of every conceivable Foundry and Core Room Practice.

Penolyn Core Oil offers these 10 Important Features for full efficiency—

- Uniformity
- Concentrated form
- No obnoxious odor
- No seepage
- No crusting of green mix
- Clean working
- Wide temperature baking range
- Polymerized formulation
- Minimum gas
- Ample collapsibility

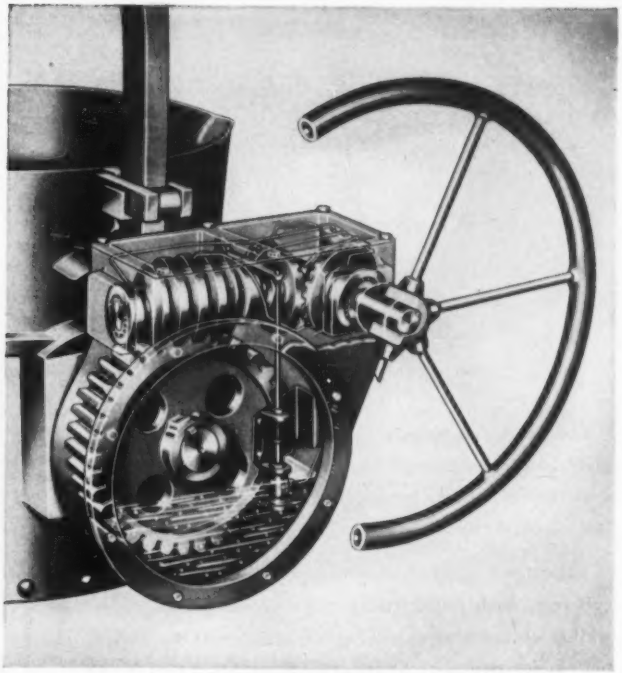
PENOLA OIL COMPANY

NEW YORK • DETROIT • CHICAGO • ST. LOUIS

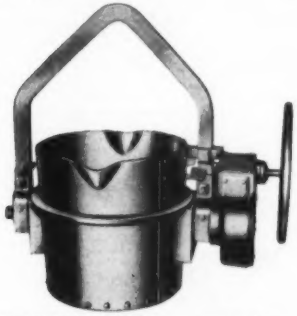
Penola

FOR EXPERT TECHNICAL ASSISTANCE — be sure to call the nearest Penola Office for any technical data or assistance you may need regarding *your* casting operations.

This Worm Ladle Gearing ELIMINATES GASKET ADJUSTMENTS



- Completely enclosed and self contained
- Automatic force-feed lubrication
- Positively self locking in any position
- Precision cut gears



Model 592T ladle with new type gearing. Also notice use of Industrial Equipment's much talked-about UNIVERSAL BAIL. This bail completely eliminates binding due to heat distortion or misalignment.

. . . WORM AND BEVEL GEAR ASSEMBLY COMPLETELY ADJUSTABLE

Here is another Industrial Equipment Company first . . . new, improved worm ladle gearing bringing *complete universal adjustability.*

Take a close look at the phantom view. Here is a one-piece, self-contained unit with all parts easily accessible. Your maintenance man can quickly make back-lash adjustments to pin-point accuracy and positive adjustment by adjusting the bearing lock nuts on all gears and worm. These nuts are easily reached and with working space to spare.

Unaffected by Heat

There is no connection between the bail and the gearing. No clearance for heat distortion is necessary, permitting an assembly almost to machine tool precision.

Industrial's new gearing is absolutely safe and positively self locking. The high ratio between worm and worm gear locks the ladle in any position. Incidentally, worm and bevel gears are of high tensile semi-steel and the worm is of high alloy steel. All are precision cut. Shafts are mounted on anti-friction bearings.

Now Standard Equipment

All Industrial geared ladles are now supplied with this outstanding new type of gearing. In addition, this gearing can be supplied for any Industrial worm geared ladles now in operation. *Write for details.*

Do you have our revised catalog No. 35?

Industrial
EQUIPMENT COMPANY
115 N. Ohio St., Minster, Ohio

LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

IT'S *Actually* THE MULTIPLE WASHING ACTION

THAT MAKES THE MULTI-WASH *so efficient!*

The Schneible patented Vari-vane construction gives the *extra* washing action that makes Multi-Wash dust control systems outstanding in efficiency and low cost operation.

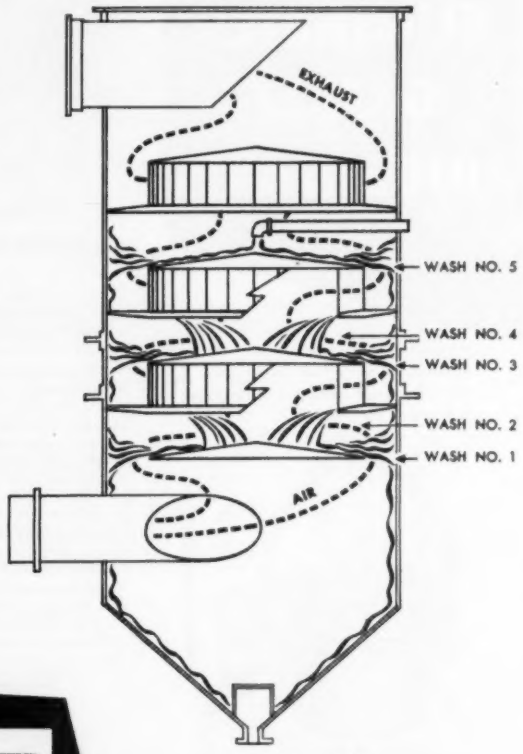
The cutaway diagram shows a type JC—2½ stage collector. Each impingement stage provides two washes of incoming dust-laden air, plus one at the bottom deflector plate, or five separate washes. This thorough scrubbing removes ordinary dust particles down to the two micron range, which drop to the sludge cone and then go to the dewatering tank.

For each impingement stage that is added, two extra washes are provided, increasing the efficiency and allowing the collection of finer particles down to sub-micron ranges.

It's easy to see why Multi-Wash is preferred by foundrymen who insist on the utmost in efficiency with lowest maintenance cost!

Your local Schneible representative can help you provide better dust control, or write direct for complete information.

Cross-section diagram of type JC Multi-Wash collector showing 5 points of washing action. The type IC with 4½ impingement stages provides 9 washes while the HC with 6½ stages gives a total of 13 washes for removal of extremely fine particles.



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PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

CLAUDE B. SCHNEIBLE COMPANY • P. O. BOX 81, NORTH END STATION • DETROIT 2, MICHIGAN

Foundry men in the news

Admiral A. G. Noble, USN, (Retired), has been elected executive vice-president and a member of the board of directors of the Nordberg Manufacturing Co., Milwaukee. Admiral Noble comes to Nordberg from Martin-Parry Corp. of Toledo, where he was vice-president and general manager since his retirement from the Navy in 1951. A native of Texas, Admiral Noble has a master's degree in mechanical engineering from MIT. Prior to his retirement, he served as chief of naval materiel and was in general charge of the entire Navy procurement program; before that he was chief of the Bureau of Ordnance. In addition to campaign victory medals, he holds the Navy Cross, Navy Legion of Merit with two gold stars, and Distinguished Service Medals from the Navy and the Army.

George L. Dirks has accepted the position of general manager of the Blaw-Knox Div. at Blawnox, Pa. He succeeds D. V. Sherlock, who returned from retirement to serve temporarily as acting general manager of that division. Mr. Dirks has served as general manager of the Canadian division of Yale & Towne Manufacturing Co., Albert Ramond & Associates, and B. F. Goodrich Co., Akron. During the war years he developed and operated Goodrich's Metal Products Manufacturing division for the production of ordnance and war materiel.

C. R. Sizemore has been promoted from manager of basic operations at Pittsburgh Coke & Chemical Co., to general plant manager in charge of all the firm's Neville Island plant operations.

Harry C. Martin has been elected a vice-president of the Carborundum Co. He will continue active direction of Carborundum's research and development activities and will also serve as principal advisor to the president on all technical matters. Mr. Martin began his career in Carborundum's research laboratory, and later headed the company's silicon foundry operations as control and product engineer in the coated products division. His duties in connection with rubber and shellac bonding materials led to one of his developments—a method for making cold molded resin bonded abrasive wheels.

Frank S. Brewster

Admiral A. G. Noble

Frank S. Brewster has been elected vice-president and general manager of Harry W. Dietert Co., Detroit. When Mr. Brewster joined Dietert Co. in 1946 he brought to his duties a broad experience gained as chemist and metallurgist during his affiliation with Atlas Drop Forge Co., Saginaw Malleable Iron, Baker Perkins, Inc., and Dow Chemical Co. He is a member of a number of technical organizations and is vice-chairman of the A.F.S. Sand Division. **Douglas L. Buss** has been elected executive vice-president and treasurer of the company while **H. W. Dietert** continues as president and **Jess Toth** as secretary and assistant treasurer.

C. E. Blanchard was honor guest at a recent luncheon in celebration of a half century with Joseph Dixon Crucible Co., Jersey City, N. J.

J. Thomas Willett has been elected vice-president in charge of all operations of Founders Mutual Casualty Co., Chicago. The company handles accident and liability insurance for foundries in Illinois and Indiana. An entirely independent organization, Founders Mutual is an outgrowth of the original A.F.S. safety & hygiene program of the 1930's. Mr. Willett has worked in most departments of the United States home office of General Accident & Liability Insurance Co., Ltd., Zurich, Switzerland, during the past 20 years.

Richard H. Shurmer has joined the Hydro-Blast Corp., Chicago, as sand technician and foundry engineer. After graduation in engineering from Ohio State University, he spent four years with Ferro Machine & Foundry, Inc., Cleveland, as sand control supervisor. For the past year he was foundry engineer at Richmond Foundry and Manufacturing Co., Richmond, Va.

T. H. Wickenden, vice-president in charge of development and research of International Nickel Co., Inc., New York, has been elected a member of the Welding Research Council of the Engineering Foundation for a three-year term beginning October 1.

Eric O. Prange has been appointed district manager of the Detroit branch office of Claud S. Gordon Co., Chicago. Mr. Prange is a graduate engineer of Wayne University and formerly plant and tool engineer with Michigan Steel Casting Co.

Sands G. Falk has been named manager of the newly combined foundry and weldment sales divisions of Falk Corp., Chicago. Handling weldment sales is **David P. Miller** who will also be active in castings sales on accounts that use both weldments and castings. **Steward C. Haven** has transferred from the Foundry Operating Div. to the Foundry and Weldment Sales Div. He will concentrate chiefly on steel castings sales.

Eugene V. Ivanso has been named head of metallurgical engineering and research at the Detroit Testing Laboratory. Mr. Ivanso, who started in industry as an apprentice molder in Cleveland, has spent 16 years in Detroit with Bundy Tubing Co., Wyandotte Chemicals Corp., and Steel Sales Corp.

James H. Lowe has been designated product development director of Steel Founders' Society of America. A veteran proponent of product engineering

advances in the foundry industry. Mr. Lowe formerly was technical and research director of Wehr Steel Co., Milwaukee. Following completion of his engineering education at the University of Wisconsin, Mr. Lowe joined the engineering staff of E. I. du Pont de Nemours & Co., becoming technical supervisor and supervisor of all operations of the du Pont military explosives division. He has contributed to SFSA and

Pacific, Cyclotherm, and Metal Products divisions. He has been with the firm since 1922.

F. L. Cuthbert has again collaborated with **Thomas M. Dyer** in a paper on bentonite. Their work (page 75) this time gives information on the influence of various analyses of water on the foundry properties of bentonite. In June 1951 they told how drying temperature

this month is a progress report on a continuing study of cupola-air furnace duplexing. He first reported on the effect of loss of silicon and its subsequent replacement in 1950.

Edward H. Platz Jr., alloy sales manager of Lebanon Steel Foundry, Lebanon, Pa., has been assigned to the Nickel Section of the Ferro-Alloys Branch of NPA in Washington, D.C. After an ex-

James H. Lowe

F. L. Cuthbert

Frank S. Kleeman

A.F.S. publications on a broad range of subjects relating to steel casting production. He is a member of American Foundrymen's Society, American Society for Metals, American Society for Quality Control, and has been a member of the U. S. Ordnance Metallurgical Advisory Committee for Cast Armor.

William J. Kingsley has been appointed general sales manager of the Carborundum Co., Niagara Falls. In his new position, Mr. Kingsley will assist the general sales manager in all general sales activities of the company.

Robert W. Crozier has taken over the duties of regional manager in charge of the Pittsburgh and Cleveland offices of Electro Metallurgical Co., New York.

Herman J. Pfeifer has been made district manager of the company's newly established sales office in Houston, Texas.

Joseph N. Schicker has been transferred from the Detroit office to the St. Louis office of Peninsular Grinding Wheel Sales Corp., Detroit, and **Joseph A. Srebalus** has been transferred from St. Louis to the Indianapolis office.

O. D. Conover, foundry engineer who has directed the operations of his own firm since its founding in 1932, and his entire staff have joined the organization of H. K. Ferguson Co., Cleveland.

Howard B. Steggall, a vice-president of United States Radiator Corp., Detroit, since 1945, has been appointed senior vice-president. In his new capacity he will have direct responsibility for sales, manufacturing, engineering, advertising, and industrial relations for the U.S.,

and moisture content affected bentonite bonding properties. Dr. Cuthbert was formerly director of sales and service laboratories for Baroid Sales Div., National Lead Co., in Houston. He is presently technical director of the National Lead Co. of Ohio, Cincinnati. Mr. Dyer was a chemist for Baroid Sales Div., National Lead Co., Los Angeles, until he took a position in the oil industry.

Wilfred H. Stewart assumes the position of chief process engineer for the U.S. Reduction Co., East Chicago, Ind. He attended the University of Florida and the University of Michigan and has spent practically all his industrial career in the aluminum industry, having been associated with Kaiser Aluminum and Chemical Corp. in their Alloys Division.

Lester A. Shea is on leave of absence from his post as general sales manager for Lindberg Engineering Co., Chicago. He has been selected chief of the Industrial Heating Equipment Section, Metalworking Equipment Div. of the NPA.

H. S. Newhall, manager of the Electrothermic Div., Pittsburgh Lectromelt Furnace Corp., left recently on a round-the-world trip to visit many of the company's 1,056 installations. Newhall's trip will include visits at installations in Europe, Pakistan, and Japan.

Milton Tilley, metallurgist, National Malleable & Steel Castings Co., Cleveland, reports another bit of practical information on malleable iron in his article on influence of cupola melting conditions on nodule count (page 46). His article

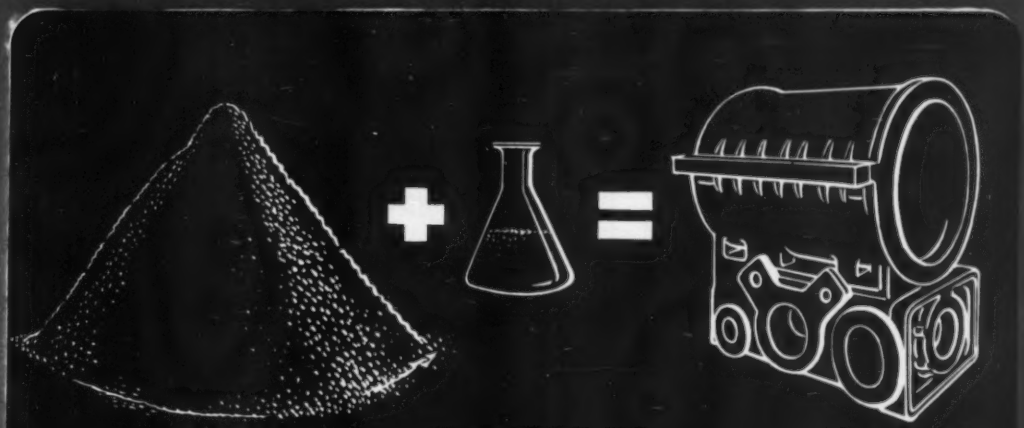
pected six months' tour of duty he will return to Lebanon. He served on various industry advisory committees during and after World War II.

Frank S. Kleeman, whose paper on page 61 describes the influence of silicon carbide as a deoxidizer in the cupola, has had a variety of experience since entering the foundry industry in 1937 as an assistant chemist. He has been chief chemist, foundry development engineer, research engineer, sales engineer, partner in a foundry, technical editor of *Industrial Heating*, and is now a consultant. Cupola deoxidation has been of special interest to him for some six years. He gave his first talk on the subject before the Ontario Chapter in 1946.

Kenneth MacKay Smith has just returned from a 9-month tour of duty as foundry consultant in Italy. Member of a Mutual Security Agency foundry team, he describes (page 56) some of his experiences among Italian foundrymen in this issue. Though conditions and materials are different from what American foundrymen are accustomed to, they will find Mr. Smith's description of the solution to Italian problems in molding sand, mechanization, and cupola operation interesting and instructive.

James N. Wessel has been appointed supervisory production metallurgist at the Puget Sound Naval Shipyard, Bremerton, Wash. After graduation from Michigan College of Mining and Technology at the head of his class in 1933 he joined the staff of Campbell, Wyant and Cannon Foundry Co., Muskegon, Mich. In 1939 he became metallurgist

continued on page 100



Here's PRODUCTION ARITHMETIC THAT MAKES PROFITS!

New Stevens Sand Conditioner, a sand lubricant and release agent, saves you time and money . . . assures you of better castings. Here's why:

1. **It increases the flowability and ramability of core sand containing cereal flour and core oil, or phenolic resins.**
2. **Cores are more easily released from all types of core boxes.**
3. **Keeps sand from sticking in hoppers, conveyors, mullers and all types of sand handling equipment.**
4. **Reduces dusting and loss from the muller of fines from cereal flour, resins, wood flour and clay.**
5. **Prevents the loss of green strength on overmulling the sand.**

Stevens Sand Conditioner is safe to use . . . it's NON-TOXIC. The cost is small . . . from a fraction of a cent to a few cents per casting.

For complete information about this new Stevens product, send for STEVENS TECHNICAL BULLETIN No. F-101. This bulletin gives you the whole story on the use of Stevens Sand Conditioner. There's no obligation, of course, and you may find the answer to some of YOUR foundry problems here. Write today. FREDERIC B. STEVENS, INC., DETROIT 16, MICHIGAN.

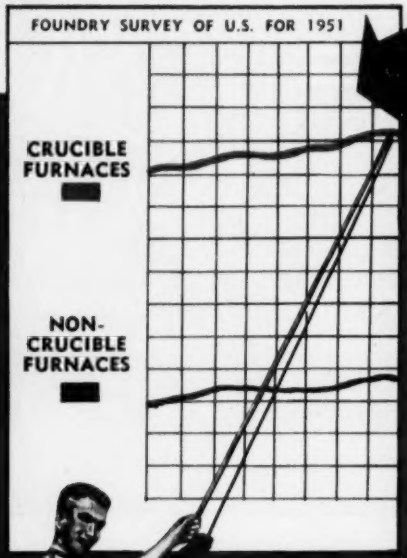
"EVERYTHING FOR A FOUNDRY"
TRADEMARK

FREDERIC B. STEVENS INCORPORATED

DETROIT 16, MICHIGAN

CRUCIBLE MELTING

... LEADS three to one



A foundry survey* of the United States for 1951 gives capacity of all Crucible furnaces at 4,703,037 lbs. of non-ferrous metals: all non-Crucible furnaces, capacity 1,406,165 lbs.

According to the same survey, the total capacity per charge of all Crucible furnaces is steadily increasing; thus, in 1950 the figure was 4,322,008 lbs., an increase for 1951 of 381,000 lbs. or 8.8%.

Foundrymen know their melting methods. Such persistent popularity and preference result from a combination of advantages obtainable only with Crucible melting.

*The Foundry Industry Data Book—The Foundry

CRUCIBLE MELTERS' HANDBOOK SENT FREE; GIVES INFORMATION ON THE CARE AND USE OF CRUCIBLES.

CRUCIBLE MANUFACTURERS ASSOCIATION

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR **CRUCIBLE MELTING**

AMERICAN REFRACTORIES & CRUCIBLE CORP.

JOSEPH DIXON CRUCIBLE CO.

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VESUVIUS CRUCIBLE CO.

trends

Direct hit has delayed action...

■ Evidently almost everyone tacitly approved the thoughts of Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, whose editorial *"What is Precision Casting?"* appeared in the February 1952 issue of AMERICAN FOUNDRYMAN. There was little reaction. Appreciation, though not noticeable at that time, was undoubtedly felt particularly by green sand foundrymen on reading his admonition: "Don't sell sand castings short as precision parts . . . Don't forget that a number of small parts can be rapidly and accurately produced in sand foundries by use of a match-plate pattern . . ."

Approval has belatedly been expressed, and foundrymen are not only applauding Brown's thoughts, but are pointing to lack of public evidence that shell molding is a pronounced production success. It shows, they say, that this precision casting process—in its present state of development—may be over-rated. As in the past, AMERICAN FOUNDRYMAN is waiting for the foundry industry to determine through experience where shell molding fits into the scheme of foundry production. And is also waiting for designers and castings users to decide where shell mold castings are most useful.

In the meantime, an undercurrent of skepticism regarding the merits of shell molding has developed among a variety of people. These include die-hard green sand founders, inveterate users of natural sands, and foundrymen who have not yet made shell molding work to their own or their management's satisfaction.

Even after shell molding finds its niche in the field of sand casting, die casting, plaster casting, investment casting, and permanent mold casting, designers and users may well question which process to use from time to time. Meanwhile, Brown's recommendation to "examine all the [casting] methods" seems like good advice.

Fascinating reading...

■ "Isn't TRANSACTIONS fascinating?" asked a top light-metals man recently. We agreed as he went on to tell that he never fails to stop and read other material he finds on thumbing through a volume to locate a specific reference. He's much like the consultant in the ferrous field who told us he finds the foundry literature fascinating and extremely useful. He refers to it constantly and says that if foundrymen would only read they wouldn't need him so much.

Whether he knows it or not, he's following the trail of a consultant of last generation. The earlier expert was called in by a foundry some years ago to solve a problem which was causing considerable trouble. He got the shop out of trouble, then wrote a detailed report incorporating his recommendations and the reasons behind them.

As he was handed a check for his work, the consultant suggested that perhaps he shouldn't accept a fee. His client, quite understandably surprised, asked why. The consultant explained that as a member of A.F.S. (then A.F.A.) the client had access to the same sources of information the consultant used. In fact, it was pointed out, the client was almost surrounded by TRANSACTIONS and other Society literature which filled several bookcases in his office. There wasn't a recommendation in his report, the consultant declared, that could not be found in the Society literature!

Modern foundry methods

A foundry faces the future

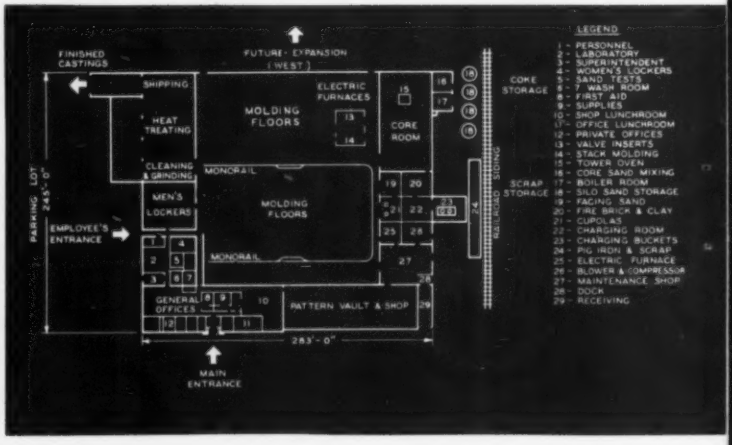
■ Ever try devising a formula for solving all the foundryman's problems—one aimed at producing the perfect foundry operation? That is the task officials of the Wells Manufacturing Company have undertaken. Of course, achieving the ideal foundry operation, as in any other field, is an obviously remote possibility. But by most standards of comparison, Wells is well on its way. Here are some of the elements in the company's formula for the Foundry of the Future.

First step in the Wells program for achieving a better foundry operation was made on June 17, 1946. On that date the Wells Manufacturing Company was incorporated as a business in the State of Illinois. Previous to that time the organization was known as Plant "B" of the Chicago Foundry Company, with facilities located in Des Plaines, Ill. Aquisition of the Plant "B" business, personnel and facilities was negotiated by M. K. Wells, president of the new organization, with the assistance of Vice-President H. K. Johnson and other foundry experts and business associates.

Chief function of the original plant was the production of valve-lifter castings. Objective of the new company, however, was full-scale production of all castings within the limits of medium-size-foundry operations.

For this purpose, 10 acres of land was acquired in Skokie, Ill. An ultra-modern plant, now expanded to 72,000 sq ft of floor space was constructed. And a farsighted formula for improved foundry operation has

Conferring on operations, President M. K. Wells and Vice-President H. K. Johnson study layout (below) of plant's 72,000 sq ft of floor space and other facilities.



been put into effect. Here are some of the factors in that formula:

Concise controls established

"Lack of accurate scheduling has been the bane of the foundry industry," Mr. Wells points out. "Foundry work must be controlled so as to achieve the ultimate in production-line technique. Not only must every supervisor know the immediate status of each purchase-order fulfillment for which he is responsible—he must also know the additional amount of such obligations that the operations under his supervision can assume."

With this objective in mind, Wells engaged the services of Kenneth W. Large, a foundry-production expert, as the production supervisor. Under his direction, a concise, day-by-day record is kept on both actual and potential production. Time requirements on all prospective purchase orders are estimated (in collaboration with Foundry Superintendent A. S. Hedberg) so as to gear the date-of-demand to the average production potential.

Production simplified

This sort of production control enables Wells not only to be accurate about a promised date-of-delivery, it also makes possible speedy and reassuring reports when the customer spot-checks progress on work which he has ordered. The weekly scheduling conferences permit the company to contract new work with complete confidence of fulfillment.

Mechanization is introduced only where it will increase speed of production—and lower costs. For instance, Wells saw no advantage in highly mechanizing the handling of molds and sand.

Both match-plate and cope-and-drag work are done on portable jolt-squeeze machines. Molds are made in snap flasks. In cope-and-drag work, they are made by two-men teams, or by three-men teams where core-setting is required. The teams move the machines along windrows of sand in the six bays on the molding floor.

"Our sort of operation," Mr. Wells explains, "eliminates the need for sand and mold conveyor equipment. It also establishes a spirit of competition on the part of the teams which make up the molding crews—that adds up to good morale and improved production."

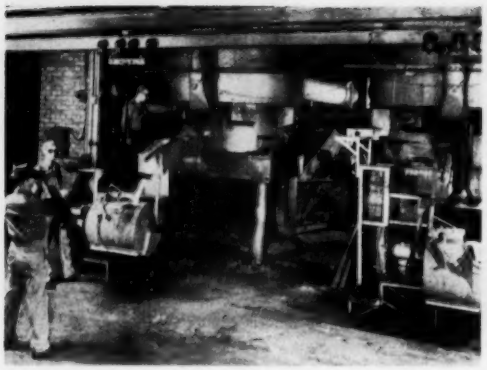
Heats for major pourings are tapped from one of two cupolas used

New purchase order is scheduled by Production Supervisor Kenneth W. Large.

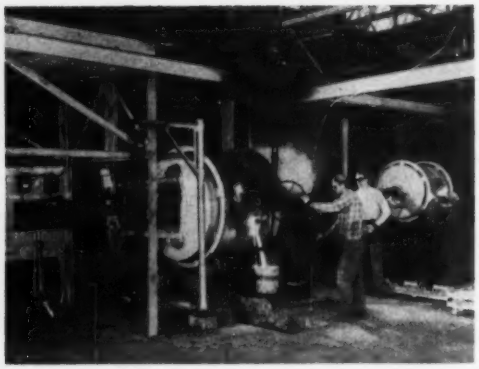
Maintenance crew makes ready one of jolt-squeeze machines used in molding.

Machines are moved along windrows of sand in molding operation—by two-men teams in cope-and-drag work, or by three-men teams where core setting is required.

Molds are placed on floor as they are made—monorail will bring metal to them.



Heats for major pourings are tapped from two cupolas used on alternate days. Note fume-exhaust pipes above tapholes.



Three indirect-arc electric furnaces (capacities: 1,500-2,000 lb) supplement cupolas in special melting operations.

Covered ladles (600-lb capacity) transport hot metals, via the monorail system, to pourers in the six molding bays.

One worker pours molds from crane ladle as helper moves jackets back in preparation for pouring next row.

Castings are gathered, after hand shakeout, and then picked up by lift trucks for delivery to the cleaning room.

In cleaning room, castings go through airless blast barrel and are finished on grinding machines. Castings are annealed in furnace in left background.

Careful inspection before shipping assures customers of quality product.

Coreroom is equipped with tower oven. Mixing room is at base of four storage silos. Most cores are blown.

Pattern room is equipped chiefly for pattern repair—emphasis is placed on maintenance of equipment.

on alternate days. Three indirect-arc electric furnaces (with melting capacities from 1500 to 2000 lb) and one induction furnace are also employed in melting operations. Slag is granulated by water in portable disposal units. Covered ladles (600 lb capacity) carry the hot iron, via a complete monorail system, to pouring ladles which serve the various molding bays.

Poured molds are shaken out by hand, gates and runners are broken off, and rough castings are transported by lift trucks into the cleaning room. There they are put through an airless blast barrel and finished on various grinding machines.

Meanwhile a portable sand-conditioning unit passes over the used sand, tempering it, removing all foreign material and placing it in neat windrows for the next day's operation.

The whole procedure from receiving ramps for raw materials (a railroad spur supplies them) to loading docks from which finished products are shipped is carefully charted. A time-and-motion expert could find little to criticize.

Foundry within a foundry

Complete mechanization is utilized in a special operation which produces valve-seat inserts. An indirect-arc electric furnace, automatic sand handling and mechanized molding and pouring equipment are employed in producing up to 100,000 of these castings a day. The unit, which really comprises a foundry within a foundry, supplies a large portion of the valve-seat inserts used in automotive and aircraft engines.

Production of both valve-seat inserts and valve tappets requires special skills in foundry practice. The relatively small parts must be made to close tolerance and must possess high strength. Tappets require chills to provide a specified face hardness. Chill depths are controlled closely, as are other casting operations, by two metallurgists and a staff of laboratory technicians.

The company maintains complete laboratory facilities, including equipment for hardness and tensile testing. Recently, laboratory space has been expanded to include up-to-the-minute sand-testing facilities.

In addition to valve-seats and tappets, the company produces a variety of gray iron castings ranging in weight from less than an ounce up to 75 lb. Capacity is rated at approxi-

Sand is tested regularly for stength, permeability, moisture, and fineness.

Well-equipped laboratory enables metallurgists and staff of technicians to maintain constant control on the composition and quality of various castings.

mately 60 tons per day, depending upon the size of the castings in production.

Good housekeeping required

"We've made the old saying 'dirty as a foundry' pure libel," Vice-President Johnson points out. And it's true that Wells does maintain an exceptionally clean house. Spotless corridors and well-appointed offices in the executive department are matched, within limits of a given operation, by appointments and maintenance of other work areas throughout the plant. Lockers, showers, toilet and lunch rooms are immaculate. To a remarkable degree the entire plant, even the molding area, is kept in the same order.

Offices, locker rooms, showers and the like are radiant-heated from pipes imbedded in the floors. Cone-type space heaters, suspended from the ceiling, serve the molding area. Gas-fired, fan-ventilated clothes drying cabinets are provided.

Good housekeeping (in such a good house), the company believes, is largely responsible for its safety record—one of the best in the Chicago area. Injuries that do occur are treated in a spotless first-aid room. Ventilation and exhaust systems for fume elimination are installed throughout the plant. The entire west wall of the molding area is comprised of windows, making the room a light, airy and cheerful place in which to work.

Planned expansion

That west wall of glass is another factor in the Wells' formula for solving future problems. The entire plant structure has been planned with ease and economy of future expansion in mind. The accompanying plant layout shows how core room, molding area and cleaning room can be extended by mere removal of the wall and construction of the required addition.

Evidence that the expansion for which Wells planned is being realized is a matter of record. Since operations were initiated, tonnage poured has risen from 12 to an average of 50 a day. Employees have increased from 60 to 225. The original 21,600 sq ft of floor space has been expanded to 72,000.

By all counts, Wells Manufacturing Company is one of those foundries that is facing up to the future. The Wells' record—in production, expansion, safety, morale—makes it evident that the far view pays off.

Foundry-within-a-foundry is completely mechanized unit that can produce up to 100,000 valve-seat inserts a day. Stack molds are poured directly from electric furnace to which they are moved on simple rail and bottom-board-dolly system.

Employer-employee cooperation is kept on high level by occasional open-house sessions to show workers and visitors latest company products and progress.

Employee lunch room is equipped with milk, coffee and soft-drink dispensers. Music is piped in during lunch hour. Space is radiant-heated through floor.

Tentative program released for

1953 CONVENTION

■ An expanded technical program for the 1953 A.F.S. Convention, to be held in Chicago May 4 through 8, has required scheduling five days instead of the usual four for a non-exhibit Convention. Program & Papers Committees of the eight technical divisions met, some as early as last May during the International Foundry Congress, and are still holding meetings to select the best possible papers for presentation next May. General interest committees are doing the same.

Deadline for papers for presentation at next year's Convention is December 15 when manuscripts must be in the hands of A.F.S. Technical Director S. C. Massari for distribution to the appropriate committee. Papers, in duplicate, may be mailed to A.F.S. Headquarters at 616 S. Michigan Ave., Chicago 5, Ill., or directly to the appropriate committee chairman.

Plan broad program

Papers on every phase of foundry operation will appear on the final schedule. In addition to the usual papers on aluminum and magnesium, the Light Metals Division (formerly Aluminum & Magnesium) has planned two sessions on melting and casting of titanium. Another feature of the 1953 program is the Symposium on Sand Reclamation which will take most of Wednesday, May 6, and will cover all types of reclamation, all types of sand, and will include operating and cost data based on existing installations.

As is the custom, sessions are grouped along specific interest lines to enable foundrymen who may not wish to remain for the entire week to attend sessions of greatest interest to them in the shortest possible time. Shop course sessions will be held at the customary time again this year—evening—to allow local shop men to take advantage of these informal, off-the-record discussions. Registration is not required for par-

continued on page 110

Tentative Program . . . 57th Annual Meeting
American Foundrymen's Society
Chicago, May 4-8, 1953

Monday, May 4

8:30 a.m. . . Registration begins
10:00 a.m. . . Technical Sessions
Light Metals
Brass & Bronze
Malleable
12:00 noon . . Light Metals Round Table Luncheon
2:00 p.m. . . Technical Sessions
Malleable
Brass & Bronze
Educational
4:00 p.m. . . Technical Session
Light Metals
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course

Tuesday, May 5

8:30 a.m. . . Registration opens
10:00 a.m. . . Technical Sessions
Light Metals
Heat Transfer
Malleable
12:00 noon . . Brass & Bronze Round Table Luncheon
Malleable Round Table Luncheon
2:00 p.m. . . Technical Sessions
Light Metals
Heat Transfer
Educational
4:00 p.m. . . Technical Sessions
Pattern
Brass & Bronze
Safety & Hygiene & Air Pollution
6:30 p.m. . . Educational Dinner
Canadian Dinner
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course

Wednesday, May 6

8:30 a.m. . . Registration opens
9:00 a.m. . . Past Presidents' Breakfast
10:00 a.m. . . Symposium on Sand Reclamation
12:00 noon . . Pattern Round Table Luncheon
2:00 p.m. . . Symposium on Sand Reclamation
4:00 p.m. . . Technical Session
Refractories
Timestudy & Methods
Safety & Hygiene & Air Pollution
7:00 p.m. . . Annual Banquet

Thursday, May 7

9:00 a.m. . . Registration opens
10:00 a.m. . . Annual Business Meeting
Charles Edgar Hoyt Annual Lecture
12:00 noon . . Gray Iron Round Table Luncheon
Steel Round Table Luncheon
2:00 p.m. . . Technical Sessions
Sand
Foundry Cost
Refractories
Plant & Plant Equipment
4:00 p.m. . . Technical Sessions
Gray Iron
Steel
Timestudy & Methods
7:00 p.m. . . A. F. S. Alumni Dinner
8:00 p.m. . . Gray Iron Shop Course
Sand Shop Course
Plant & Plant Equipment

Friday, May 8

9:00 a.m. . . Registration opens
10:00 a.m. . . Technical Sessions
Gray Iron
Steel
Sand
2:00 p.m. . . Technical Sessions
Gray Iron
Steel

Simple steps lead to successful foundry safety program

Best safety device in any foundry is a careful worker. With humanitarian considerations in mind, plus the knowledge that 85 per cent of all accidents are caused by people — not unsafe plant conditions or unsafe machines —Wm. N. Davis, director of Safety & Hygiene & Air Pollution for A.F.S. tells why and how to train people to work safely. The article is based on his talk at the 1952 annual meeting of the National Foundry Association.

WM. N. DAVIS / *Director, Safety & Hygiene & Air Pollution, A. F. S.*

■ Foremost reason for a foundry safety program is humanitarian. No one wants employees or fellow workers injured or killed.

All foundries want good employee relations. A well-managed safety program develops good employee relations and eliminates the erroneous conception that the foundry is a hot, dirty, dusty, dangerous place in which to work.

Steel plants are no longer considered dangerous and safety records indicate that they are not. The steel industry has been working at safety a long time and last year brought its accident frequency rate down to 4.6. That is 4.6 lost time accidents per million man hours worked.

Room for improvement

For the foundry industry the first quarter of this year the average rate was 26.9. This figure is made up of 29.6 for gray iron foundries, 27.6 for steel foundries, and 23.5 for non-ferrous shops. Even comparing this rate with the average frequency for all industry — 13.5 — it is evident that there is room for considerable improvement.

Some foundries with outstandingly low rates show that improvement is is possible. One foundry in the Chicago area has worked over two years without a lost-time accident. A foundry in Birmingham, Ala., has an accident frequency rate of 1.1, and several foundries in other parts of the country have rates around 2.

A third reason for developing better and better foundry safety programs is the ever-growing encroachment of regulatory bodies upon the prerogatives and responsibilities of foundry management. The theory behind the regulations and codes is that more laws is the only way to improve working conditions.

That this theory is wrong is shown by the fact that 85 per cent of all accidents are caused by people and not by unsafe machines or unsafe conditions in the plants. But so long as high frequency rates prevail, regulatory bodies will attempt to increase the laws governing industrial safety and to appoint an increasing number of inspectors to enforce them.

Current trend in regulations is shown by two federal bills, the Humphrey Bill, No. S-2325, and the Murray Bill, No. S-2714. Both are similar and primarily intended to provide funds for states to increase their factory inspection departments. The Murray Bill contained a clause calling for states receiving federal aid to set up safety programs in industries having high accident rates. The programs and inspections would be under the direction of the U. S. Department of Labor. Neither of the bills passed; both were sent back to committee.

Cost of accidents is a fourth reason for a safety program. It is often overlooked that Workmen's Compensation, insurance premiums, and medical expenses represent only a small part of the heavy cost of accidents. Studies show that hidden costs of accidents in foundries are four to seven times the actual cost in medical and Workmen's Compensation payments.

One foundry which had 97 lost time accidents in a recent year averaged $610 in compensation plus medical expenses and $1965 in indirect or hidden costs for each case. Hidden costs include:

1. Damage to the injured worker's machine or equipment or material.
2. Lost production due to stoppage of the machine or process operated by the injured worker.
3. Loss of production or damage to product or materials due to other workers being upset, shocked, or diverted from their duties.
4. Cost of selecting and training a new employee; the time spent by the foreman assisting the injured employee investigating the cause of the accident, and arranging for the continuance of the employee's work; and the lost time of fellow employees who aid the injured or clean up and repair after the accident.

Economics of safety

Even though an employee may not be injured, accidents cost money. In one case, the operator of a fork truck loaded with castings stopped to get a drink. He set the brake but left the motor running. A curious worker, interested in seeing how the truck operated, got in and eased the brake off, allowing the truck to start. Not knowing how to stop the truck, he jumped off. The truck ran into a pit, overturning the load of castings, many of which were damaged, and breaking the fork and lifting mechanism of the truck. The cost of repairing the truck alone was $1600, besides the time spent in getting it out of the pit and cleaning up the debris.

A good safety training program would have prevented the accident.

How a safety program pays off is shown by a Michigan foundry which in four years reduced its premium from $4 to 50¢ per hundred dollars of payroll. Compare this with another plant which paid a penalty premium of $4,000 last year—a dead loss. A small part of the $4,000 spent on a safety program could have eliminated the accidents and in addition saved human suffering.

Accidents cause economic loss to

employees because compensation payments are far below earnings while working. In recognition of this, state compensation boards are becoming more liberal in their claim settlements, payments, and weekly compensation payments.

With all the facts in their favor, the question might well be asked why more foundries aren't conducting successful, active, safety programs. Although the statement belies the cost studies of other foundries, some plants say they cannot afford a safety program! Admiral Ben Morrell of Jones & Laughlin Steel Corp. has said many times that J & L could not stay in business and not have safety.

Another objection to starting a safety program is lack of some one in the organization with safety training, and ignorance of how to start and how to carry on a program. Every foundry has men capable of handling a safety program. The best foundry safety men are those who have worked in foundries, who know the conditions, who know the hazards, and having applied common sense, and a little extra effort, have made ideal safety men. Many of today's most successful foundry safety men are workers of this type.

Indifference and failure to recognize the benefits of a good foundry safety program are also factors in the less than 100 per cent coverage of the industry by safety training and practice.

Cooperation necessary

The first step in setting up a safety program is for management to study the overall plant accident problem and records. These are convincing evidence that a program is possible and worthwhile. Enthusiasm for the program must stem from the top down and management must be fully sold on safety before starting the program, else supervisors and workers will reflect half-hearted efforts of management in their lack of cooperation.

If a program fails due to poor management backing, it will be that much harder to start another program later, even though a series of accidents indicates an obvious need for such a program.

With management convinced it wants and should have a safety program, the next step is to develop a safety organization. Its prime function is to enlist and maintain the interest of every person in the plant in the task of preventing accidents.

Wm. N. Davis (left), S & H & AP director of A.F.S., and Wm. W. Maloney, Society secretary-treasurer, register approval of response to safety recommendations.

The safety organization, patterned to meet the needs of the individual plant, must include (1) active executive drive and (2) leadership.

The executive drive may be furnished by the plant manager or he may delegate it to another executive or supervisor who has management's authority to carry out the program.

The leadership is provided by the safety man who, in addition to maintaining and directing the safety program, acts as liaison with insurance and state inspectors. Do not select someone already overloaded and expect him to carry out a successful accident prevention program as just another chore.

After appointing a safety man, take him on a tour of the entire plant. Develop safety consciousness by looking at each operation as though it was never viewed before. Look at it with safety-opened eyes for every possible condition and practice which might result in an accident.

Find the hazards

Looking at conditions from a new viewpoint, management and the safety man will undoubtedly see accident hazards that had not previously been recognized. These should give additional impetus to the desire to carry out the best possible safety program.

Primary object of the plant tour is to find the human and mechanical hazards—and remove them. In searching for hazards it must be recognized that only rarely, if ever, is a single factor the cause of an accident. Here are some of the things to look for on the initial tour of the plant.

Materials handling: Twenty five per cent of all accidents occur in materials handling. Is the machinery in good repair? Are the men lifting excessively heavy loads?

Plant housekeeping: Are loose materials or objects under foot? Are materials piled safely? An example of unsafe piling of materials was found in one shop where castings were dumped in a pile in front of a grinder. The man had to work over the pile in an unnatural position conducive to accidents.

Machines: Can employees get their hands into dangerous areas or into machines that are unguarded? Is equipment well lighted? In good operating order?

Electrical equipment: Is wiring exposed? Have temporary hookups been retained? Are portable grinders left lying around on benches or on the floor? Is electrical equipment properly grounded?

Work processes: Here's the cause of 85 per cent of all accidents—the human element. How do the men do their jobs? Handle materials? Do they use gloves when necessary? Do they wear goggles? Do they stop machines before adjusting them? Do they lean over moving parts? Do they stand to one side when starting a grinding wheel? Do they carry on horseplay or have quarrels? These are a few of the many things to look for.

After completing the first plant

tour, check past accident records to see how they may be related to conditions noted on the tour. Often they identify a hazardous job, condition, place, or practice, and furnish clues as to where to make the next move in the safety program.

An analysis of conditions checked during the tour and a study of the records will show that hazardous conditions and practices fall into three categories:

1. Hazards that can be eliminated immediately, such as unguarded machinery, poor housekeeping, defective tools, lighting, etc.

2. Hazards that cannot be eliminated immediately, but which can be corrected in the near future, such as improper layout of machines or unsafe processes. Until corrected, immediate steps should be taken to control and minimize the risk involved in working in these areas.

3. Unsafe working practices that require employee training.

The last is the most important factor. Every employee must be thoroughly trained in safety practice. The human factor enters into practically every accident. Every worker must be impressed with the fact that *the best possible safety device in any foundry is a careful worker.*

Foreman is key man

The key man in any safety program and the most potent in controlling human factors is the foreman. He must be sold on safety. It must be made clear to him that the work of the company depends as much on the safety record as on the production record. Foremen must work safely themselves, teach safety, and enforce safety.

Next significant step in the program is the formation of a safety committee made up of the safety man and the plant foreman. In smaller plants all foremen can work on the safety committee. In larger plants such a group would be unwieldly so foremen are moved on and off the committee at regular periods to eventually give all departments representation on the safety committee.

The safety man should go over every job in each department to make sure that every safety factor on each job has been checked. A check list or card for each job in a foreman's unit often helps. Under each item of safe practices and conditions the foreman makes brief notes of hazards. In most cases only a single word is necessary. For example, under Protective Equipment the foreman would note "safety tools" or "goggles."

On work such as maintenance, a man may do a number of jobs the common elements in all of which must be noted. These would include safe ways of handling materials and hoists, safe tools and their proper use, personal safety equipment necessary, and the like.

Instruction required

After the safety man and the foreman have discussed safe practices in the department, the foreman discusses them with each of his employees. He tells them what to do and why, and shows them how to do it. He notes each man's name on his check list and the date on which he talked safety to him. He subsequently follows up on his safety instruction, keeping a careful record on each employee. He notes, for instance, that certain men lift with their back or do not get help in lifting excessively heavy loads.

Getting every foreman to be safety minded and getting him to pass the attitude and knowledge on to each employee is the most important part of the safety program. In many cases the foreman must be taught safe methods. Many are fine at production but require help in passing on safety information to their employees. They must be instructed, then taught how to get it over to the workers.

Here's where the monthly safety meeting comes in. This should be held regularly at a specified time and place. Occasionally the committee should be invited out to dinner for a meeting which should be attended by top management. All accidents that have been reported should be reviewed at the safety meeting along with measures taken or proposed to eliminate them. Unsafe conditions or practices which have been noted at the regular plant inspection are reviewed.

The theme for the month is then introduced and committee members are instructed in it so they can pass the information on to others in the plant. The theme may be housekeeping, eyes, grinding, handling scrap, or any other safety topic which suits plant conditions.

Plant inspections are an important phase of the safety program. The safety man will profit greatly by accompanying the insurance inspector and the state factory inspector on their inspection visits. These people visit a plant infrequently so the safety man should set up a plan for regular visits to every department in the plant.

When he comes into a department, he takes the foreman with him for the inspection. Together they study every piece of equipment and every process in the department. The foreman and safety man will set up, as an example, a regular schedule for inspecting hoisting chains or the cables on the lift. Unsafe acts of employees, found during the inspection or at any other time, are immediately called to their attention by the foreman.

Last step in a safety program is the keeping of accident records so that they may be analyzed. They are often kept by the plant nurse. If the plant does not have a nurse, reports should come back from the doctor in every doctor case. In addition, each foreman should be requested to make out an accident report for every accident, whether or not a person was injured at the time of the accident. These cases are all analyzed at the regular safety meetings so that the accidents can be avoided in the future.

A.F.S. safety training

Following the simple steps outlined above will lead to a successful safety program. To help foundries set up such a program, the American Foundrymen's Society, as part of the Safety & Hygiene & Air Pollution Program being carried on for the industry, has developed a training course outline of fundamentals of foundry safety for foremen and supervisors. Trial run on the course, expected to be widely used throughout the industry, is a two-day meeting to be held in Chicago November 6 and 7. Class will be limited to 30 so that maximum value is obtained from discussion of problems brought up by foundry supervisors attending.

(EDITOR'S NOTE: The A.F.S. safety training course will be held at the Sherman Hotel, Chicago. Registration is $20.00 for A.F.S. members and S & H & AP program contributors, $35.00 for others. Fee includes all sessions, group meals, and materials. Subjects cover all phases of foundry safety and how to set up a program. Speakers are top plant safety men. All reservations for the two-day course should be made in advance by writing Wm. N. Davis, American Foundryman's Society, 616 S. Michigan Ave., Chicago 5, Ill., or by phoning HArrison 7-8320.)

S & H & AP Committee maps conferences on ventilation

Dust control and proper ventilation present one of the chief hygiene and air-pollution problems confronting foundry supervision. Here are some of the plans for organized study of such problems as outlined in a recent meeting of the S & H & AP committee assigned to that area of work.

■ Six of the nine-member, S & H & AP Committee on Dust Control and Ventilation met recently in Chicago and outlined an imposing program of conferences. Tentative arrangements were made for Health and Dust Control Conferences at the University of Illinois and the University of Wisconsin.

Decision to promote a greater degree of liaison between members of the S & H & AP Dust Control and Ventilation Committee and the FEMA Committee on Dust and Fume Equipment indicates a general intensification of work in these related fields. The S & H & AP Committee will be represented at future meetings of the FEMA Committee.

Plan annual convention role

Important decisions also were made concerning dust control and ventilation presentations at the 57th Annual A.F.S. Convention to be held in Chicago May 4 to 8, 1953. Final decisions regarding selections of speakers will be announced at the next committee meeting.

Authors of all papers to be presented will be urged to make the original paper as complete as possible, including pictures, sketches, and the like. With preprints of these papers available at the meeting, talks are to be presented in abstract form and limited to 20 minutes.

Three men from the Committee have agreed to prepare questions and comments on the preprints designed to encourage more general participation during the discussion period. The aim is to make the talk and the discussion period a guided study of a given paper, which each person will have opportunity to read prior to the session devoted to it.

The program itself will be designed to deal with problems of both large and small foundries. Proposed scheduling of the S & H & AP program is for Wednesday, the midpoint of the convention. Objective is to reach people from the non-ferrous foundries, who will be attending the first part of the Convention, as well as people from the gray iron and steel foundries who will be in attendance during the latter part of the Convention.

Scope of program

Program plans call for complete coverage of S & H & AP development, including an outline of what the Committee has done and what it is planning for the coming year.

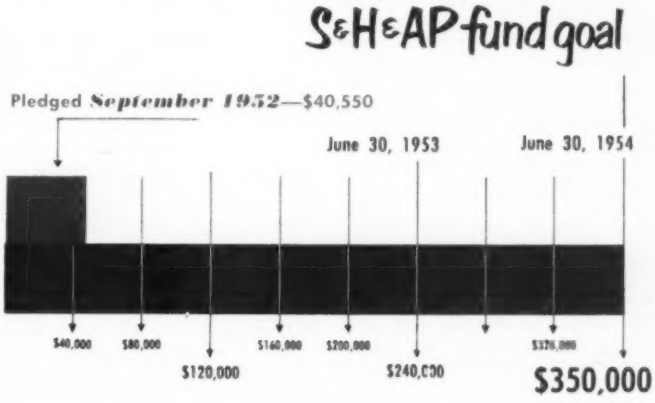
Prominent among the presentations will be a study on "*Legislative Trends in Safety, Hygiene and Air* Pollution." There will be two studies on the subject, "*Trends of Dust Control*," covering past, present and possible future developments. Scope of the program may be extended to deal with such problems as "*Noise*," pending decision of the Steering Committee. The handling of new materials going into foundries, such as those used in shell molding, may also be discussed.

To add new members

Two additional members are to be added to the Dust Control and Ventilation Committee. A representative will be selected for the non-ferrous part of the industry, and another for the smaller foundry. Further committee work, in the recent meeting, was devoted to the review of material to be used in the Dust Control and Ventilation manual now being developed.

Members attending the Committee meeting were Chairman John G. Liskow, Dust Control Div., American Air Filter Co., Inc., Louisville, Ky.; T. J. Glaza, Crane Co., Chicago; A. S. Lundy, Claude B. Schneible Co., Detroit; Wilbur W. Dodge, Caterpillar Tractor Co., Peoria, Ill.; S. C. Rothmann, Deere & Co., Moline, Ill.; F. C. Fluegge, International Harvester Co., Chicago. Sitting in at the meeting were Wm. W. Maloney, Sec.-Treas. of A.F.S.; J. R. Allen, chairman of the Steering Committee, and W. N. Davis, S & H & AP Director.

Contributions and pledges to the S & H & AP Program fund up to September 30 total $40,550 as shown below.



Effect of oxidation rates on graphitization *Of cupola-melted malleable*

MILTON TILLEY / *Metallurgist, National Mall. & Steel Castings Co., Cleveland*

Oxidation in the cupola during duplex melting has a strong influence on graphitization rate of malleable iron. Adverse effects of decreased silicon can be nullified by deoxidation, according to this report made at the 1952 Ohio Regional Foundry Conference.

■ In a paper presented at the 1950 Ohio Regional Foundry Conference (AMERICAN FOUNDRYMAN, May 1950, page 88) the author pointed out that graphitizing rate of holding furnace iron, as measured by the number of carbon nodules per cubic millimeter, was influenced tremendously by the rate of oxidation during melting in the cupola. The nodule count was in inverse proportion to the oxidation rate as measured by the loss in silicon. The average range was shown to be from 4,000 nodules at 5 per cent silicon loss to 500 nodules at 35 per cent loss. In the latter case, the iron would be laden with pearlite using a standard annealing cycle—in this case 6 F per hour temperature drop through the critical range.

Early this year it was decided to investigate the cupola metal, as it was melted and before being mixed and further refined in the holding furnace, by pouring samples at the cupola spout. The cupola is lined to 84 in. ID, uses 12,000 lb charges, and melts an average of 30 tons per hour. Accordingly, a 12,000-lb charge takes 12 minutes to melt. The cupola well holds about 1000 lb of melted metal so that at any given time a test sample represents one-twelfth of a given charge. Normally, a charge consists of 28 per cent steel scrap, 56 per cent returns, 6 per cent silvery pig, and 10 per cent foundry pig, charged in that order.

During the investigation 128 samples were poured during 20 operating days. The samples were annealed in a standard heat cycle, photomicrographs made at X100, and nodules counted. Analyses for carbon, silicon, and manganese were made on each test in the hard iron state. Relation between nodule count and oxidation of silicon was:

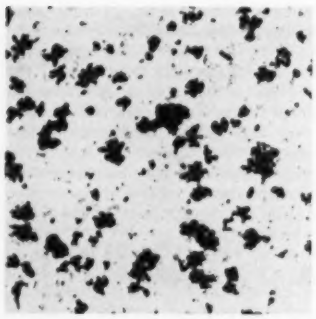


Fig. 1 . . . 12,500 nodules per cu mm in annealed malleable. Compare Fig. 2.

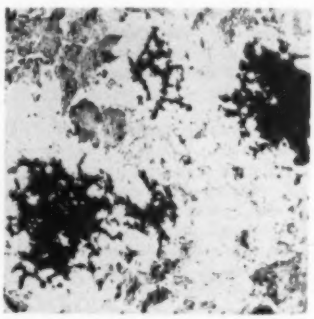


Fig. 2 . . . Variation in cupola metal is shown by sample with 256 nodules.

PER CENT SI LOSS	NODULES PER CU MM
0 to 12.5	7,750
13.0 to 25.0	3,750
25.5 to 38.0	1,750
38.5 to 50.0	375

In the early exploratory stage of the investigation, samples were poured at arbitrarily chosen times. Later they were poured according to the melting conditions as revealed mainly by the kind and number of sparks thrown off by the molten metal at the spout, and finally at 5-minute intervals for 30-minute periods.

The first two samples poured, Fig. 1 and 2, show two extremes encountered while the cupola was operating normally. Figure 1, showing 12,500 nodules per cubic millimeter, repre-

TABLE 1 . . . LOG OF TYPICAL OXIDATION AND GRAPHITIZATION TEST SERIES

Time	Metal	C, %	Si, %	Nodules/cu mm	Remarks
1:00 PM	Air Furnace	2.46	1.21	2700	Normal
1:30 "	" "	2.43	1.27	No Sample	
1:30 "	Cupola	2.12	0.93	350	Pearlitic
1:35 "	"	2.51	1.31	4100	Supernormal
1:40 "	"	2.40	0.85	300	Pearlitic
1:45 "	"	2.37	1.07	1800	Subnormal
1:50 "	"	2.60	1.22	4200	Supernormal
1:55 "	"	2.46	1.27	2450	Normal
2:00 "	"	2.27	0.99	300	Pearlitic
2:00 "	Air Furnace	2.43	1.19	No Sample	

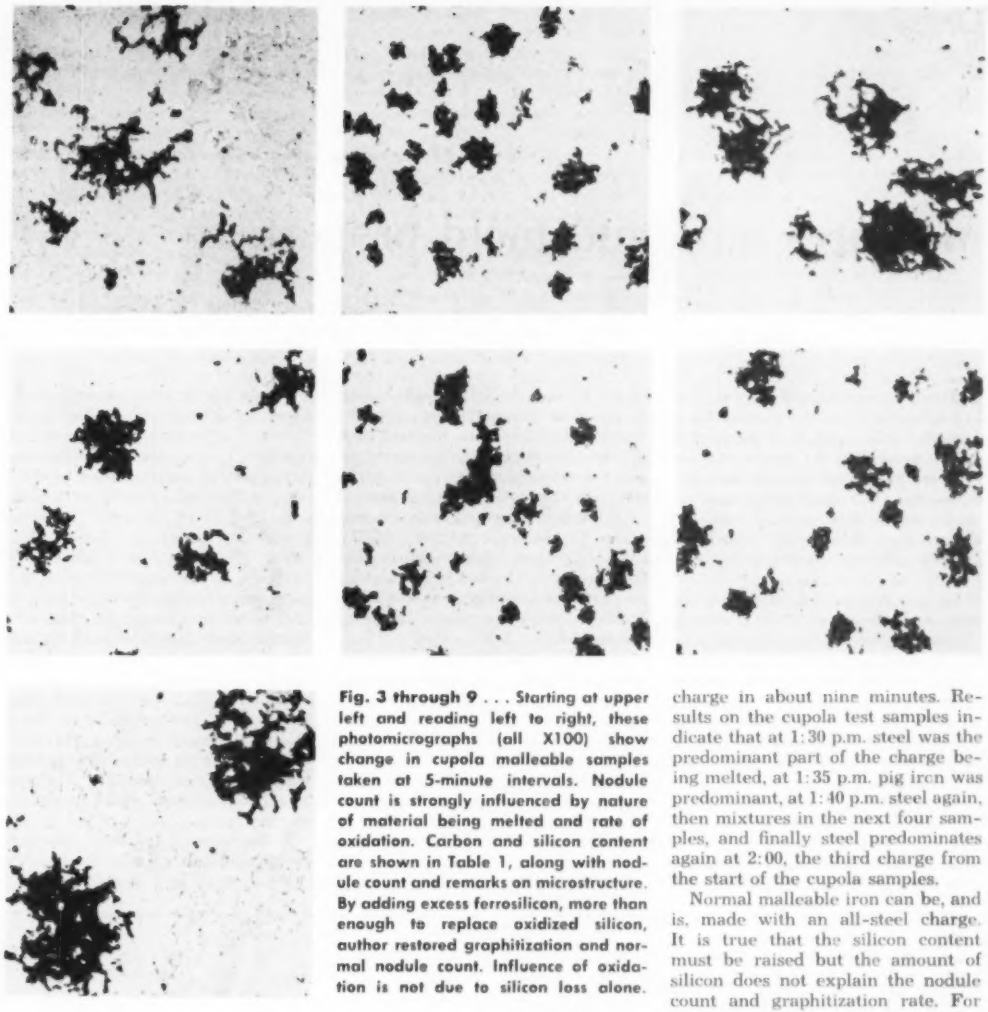


Fig. 3 through 9 . . . Starting at upper left and reading left to right, these photomicrographs (all X100) show change in cupola malleable samples taken at 5-minute intervals. Nodule count is strongly influenced by nature of material being melted and rate of oxidation. Carbon and silicon content are shown in Table 1, along with nodule count and remarks on microstructure. By adding excess ferrosilicon, more than enough to replace oxidized silicon, author restored graphitization and normal nodule count. Influence of oxidation is not due to silicon loss alone.

sents a sample poured at 11:00 a.m., while Fig. 2, with 256 nodules, was poured three hours later. Analysis of Fig. 1 showed 2.84 per cent carbon and 1.43 per cent silicon, a loss of 8 per cent from the average silicon in the charge. The specimen shown in Fig. 2 analyzed 2.50 per cent carbon and 0.81 per cent silicon, a 45 per cent silicon loss.

It must be kept in mind that since only one-twelfth of the charge is sampled, the silicon analysis is not a true picture of the actual oxidation but only indicative because of the selective melting which will be discussed later. While the nodule count varies with the silicon count, the magnitude of the difference cannot be explained by the silicon content.

When the wide fluctuations in nodule number and appearance were encountered while the cupola was melting normally, it indicated the desirability of sampling at relatively short intervals.

Accordingly, test samples were poured every five minutes for a half hour on several days. General character of results is shown in Fig. 3 through 9. In this series of samples, average oxidation, as measured by loss in silicon, was somewhat greater than normal.

Table 1 is a log of operations at a time the cupola was melting one charge in about nine minutes. Results on the cupola test samples indicate that at 1:30 p.m. steel was the predominant part of the charge being melted, at 1:35 p.m. pig iron was predominant, at 1:40 p.m. steel again, then mixtures in the next four samples, and finally steel predominates again at 2:00, the third charge from the start of the cupola samples.

Normal malleable iron can be, and is, made with an all-steel charge. It is true that the silicon content must be raised but the amount of silicon does not explain the nodule count and graphitization rate. For instance, as pointed out in the previous article, if the metal is melted at a high oxidation rate and the silicon raised to normal in the holding furnace by ferrosilicon additions, the nodule count and graphitization rate is subnormal. However, if an excess of ferrosilicon is added with a resultant higher-than-normal silicon content in the metal, the nodules and graphitization are restored. Here again the results are not accounted for by the increased silicon content.

It is concluded that oxidation during melting is a potent factor with regard to graphitization rate, and number and form of nodules, and that it can be overcome by subsequent deoxidation.

How the one-to-ten ram test

Measures sand and mold properties

CLYDE A. SANDERS / *Vice-President, American Colloid Co., Chicago*
ARTHUR G. CLEM / *Chief Chemist, American Colloid Co., Chicago*

Each time a sand mixture is compacted its mechanical properties change. These properties give a picture of the sand in use. In developing the picture, the authors use data which they do not claim is original; other investigators have reported similar findings, but have not always tried to correlate them with practical molding operations.

■ No foundry sand mixture can be considered dormant. It is squeezed, rammed, jolted, tucked, thrown, butted, or pushed into place, expanded by the heat of molten metal, crushed under the weight of the cooling metal, and blown full of vapor and gases. And each time a sand mixture is shaped, its mechanical properties are changed.

In formulating a sand mixture, the goal is the weakest, finest, and driest molding sand which will make a good casting. The laboratory technician can supply such a sand mixture to the molder, but the molder must do the near impossible, prepare the mold to coincide with the test data if a good casting is to be made. In other words, the molder must apply the same degree of ramming, jolting, or squeezing to give the same properties to the sand mixture as the sand technician did in preparing the test specimen. The key to mechanical properties is the degree to which the mold or sand specimen has been compacted.

Most foundrymen talk in terms of green strength or permeability, which is meaningless unless related to the degree of hardness or ramming. Different hardnesses give different permeabilities and green strengths. Since a mold often has complex contours and is rammed to different degrees, mold hardness varies over its surface creating a variety of mechanical properties.

Properties that exist at any given hardness can be determined by ramming specimens to varying hardnesses. Three rams is a convenient standard to use in control of a sand mixture, but the properties at three rams cannot be accepted as a complete picture of the sand in actual practice.

The authors believe that mold hardness, green compression strength, permeability, and density should be considered as a group. No single one should be discussed without considering all four. A nearly complete analysis of a sand mixture can be obtained by comparing these four green sand properties at a given moisture content. In this paper, density is given in terms of the gram weight of a standard cylindrical 2 x 2 in. specimen for convenience in measuring.

To carry out the 1-to-10 ram test, prepare a sand mixture by standard A.F.S. methods. Weigh out an

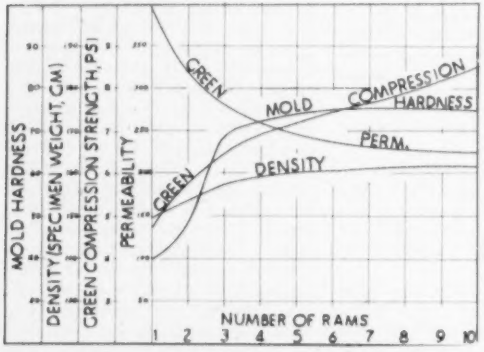


Fig. 1 . . . Properties of a troublesome molding sand. This coarse steel molding sand is too high in fines and organics, and has to be worked on the extreme dry side to insure against blows, penetration, and surface roughness. Green strength increases too slowly; permeability shows no sharp break as ramming increases. Mold hardness curve is too flat.

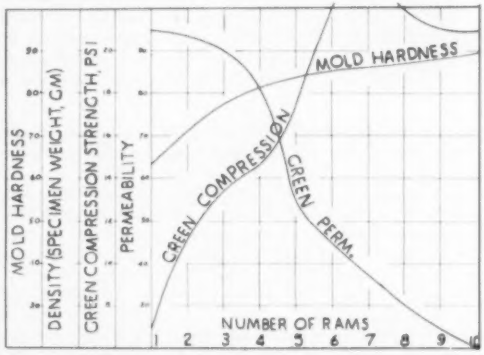


Fig. 2 . . . Troublesome, coarse gray iron molding sand, high in fines and organic matter, but tempered to proper "feel." Fines require too much water; mixture is gummy mass that will lead to defective castings. No density curve is shown because test results varied so widely curve could not be drawn; believed due to excessive fines and organic matter.

amount of sand which will give a standard 2 x 2 in. specimen with one ram. Measure the mold hardness, green compression strength, and permeability according to A.F.S. standards as defined in the Society's Foundry Sand Handbook.

Repeat the test, using two rams to form a 2 x 2 in. specimen. Then repeat using three rams and continue through ten rams. An even greater number of rams is encouraged if results show a steady change. Moisture should remain constant throughout the test.

Of course, the amount of sand mixture needed to make a 2 x 2 in. specimen will gradually increase as the number of rams is increased. Each sand mixture acts differently, and not all reach maximum density at the same number of rams.

In general, as the number of rams increases, density (specimen weight) increases, mold hardness increases, green compression strength increases, but permeability decreases. The reverse is equally true. With moisture remaining constant, curves of these four mechanical properties will give a graphic description of the working characteristics of the sand mixture.

The curves show sharp changes, peaks, hollows, and plateaus which can be correlated with molding practice. Notice especially how the permeability curves usually drop rapidly with the first few rams, then fall at a far slower rate. While the curve is falling fast the sand mixture is behaving as a plastic body; the rate of drop tells how plastic the bond is.

The 1-to-10 ram test is an excellent method of determining flowability. A foundry sand mixture with high flowability will reach its point of ideal molding rapidly—with a minimum number of rams. As the flow extends over a wider range of rams, the mixture is considered gummy, fat, or over-plastic.

The ceramist recognizes two stages in the packing of a moist sand and clay mixture. The first is *plastic flow* during which the sand grains are moved into contact with each other while the clay is squeezed into the spaces between the grains. The second stage is *compaction* in which the grains orient themselves under repeated ramming into an increasingly dense pattern with each grain in contact with the maximum number of neighboring grains.

Good sand mixtures may cease plastic flow and begin compaction with as little as one or two rams; "fat" sand mixtures may need six or seven rams to achieve the same results. Particularly unworkable sand mixtures may never reach full compaction.

If a sand mixture shows a slow increase in green compression strength, it may be assumed that there is not enough bonding clay present and that expansion difficulties may occur. See Fig. 1.

If a sand mixture rapidly and steadily continues to decrease in permeability as the number of rams is increased, it may produce very low venting with subsequent casting defects such as blows, pinholes, and porosity. See Fig. 2.

By carefully studying mold hardness and density as the number of rams is increased, flow characteristics of the sand can be observed which aid in determining the number of jolts required and the amount of butting and tucking needed to eliminate soft spots which may promote metal penetration or burn-in.

When permeability ceases its rapid drop, plastic flow has nearly halted and the sand is starting to be compacted. The point at which the change of direction takes place is near the point of ideal molding properties. Before this point the molding sand is soft and plastic. Beyond this point it becomes dense and more difficult to mold properly; over-ramming occurs, and the mold may break upon drawing the pattern unless a high deformation is obtained.

Hardness and density

The molder usually governs the hardness by ramming to that point which he believes should make a good mold. To determine mechanical properties of the mixture at any given point in the mold, the green hardness indicator should be used freely and the established graph referred to in computing.

Because moisture of sand used in production will vary somewhat the graphs should have bands rather than lines for the various properties. These are developed by running tests at the upper and lower allowable limits of moisture established by the plant.

The hardness curve is roughly a mirror image of permeability. Hardness climbs steadily, then levels off, the sudden change in direction usu-

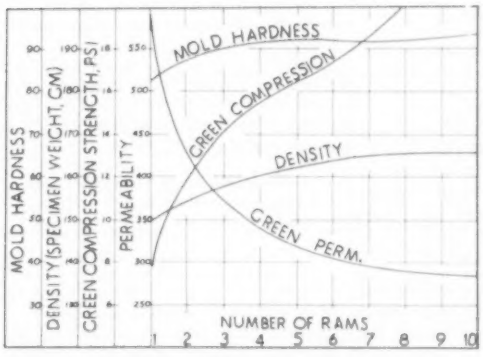


Fig. 3...Facing mixture with good flowability and excellent permeability. Mixture contains 95 parts lake sand (A.F.S. Fineness No. 50), 5 parts southern bentonite, and 2½ parts water. Mold hardness starts high, rises slowly, then levels off. Green compression climbs rapidly but does not level off, showing active bonding action.

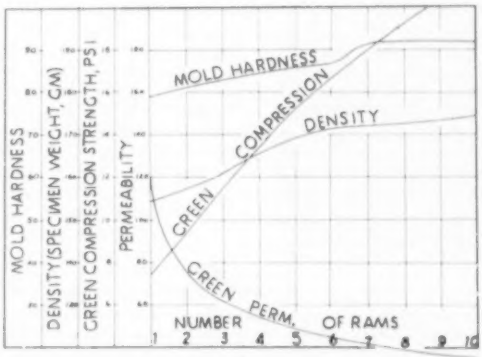


Fig. 4...A good, workable sand containing 4 per cent moisture. Sand has Fineness No. 84 with a grain distribution peak at 100 mesh. A system sand, this mixture has a permeability curve similar to the facing sand shown in Fig. 3. Ideal range of ramming for this sand is at a mold hardness of from 83 to 85 which gives good permeability and strength.

ally occurring on both permeability and hardness curves at the same degree of ramming. These two points are closely related to a change in green compression strength.

Where foundries are using cushioning materials such as wood flour, density and hardness should level out according to a standard pattern formed by the graphs. The number of rams to produce this leveling-out is usually governed by the amount of cushioning material in the mixture. To avoid high densities and hardnesses which may be detrimental to a particular casting (flat-backs, for example), more cushioning material may have to be added.

High flowability

A sand which possesses very high flowability usually reaches a high green compression strength on perhaps the first or second ram. Green compression strength may level out more rapidly than in other sand mixtures. Hardness of this mixture with high flowability usually reaches its optimum with few rams, as shown in Fig. 3.

The weaker a sand mixture, the faster this leveling out occurs, indicating low clay content. Such sand requires high wood flour additions to prevent expansion defects such as scabs, buckles, or rattails; the arrangement of the sand grains occurs too rapidly and maximum density occurs very quickly with few jolts at the machine. See Fig. 1.

Likewise, a weakly bonded sand with high flowability rams hard very quickly and permeability becomes quite low in a few rams. This is a dangerous sand, as porosity, pinholes, and blows may occur.

Molding sand which is weakly bonded should be studied closely. In many cases, the density curve indicates danger by leveling out rather rapidly. It may, for example, reach a maximum at three rams and remain there even though a greater number of rams is applied.

Mold hardness

The key to other green sand properties is mold hardness, which has been most generally neglected. Permeability is meaningless unless mold hardness is also defined. A soft-rammed mold is usually higher in permeability than a hard-rammed mold, even with the same base sand mixture. The molder has the greatest influence on this property. Mold hardness should be checked before changing a sand mixture suspected of causing defects.

Other important mechanical properties of a sand mixture can be shown by a 1-to-10 ram test. An example is deformation, an extremely important property currently under intensive investigation. A sand mixture which possesses poor flowability usually shows high deformation. This may lead to an oversize casting, and usually promotes apparent shrinks of bosses in the cope, swells, cuts, and washes, with much penetration. This type of mixture is slow to gain green compression strength, hardness, and density. Permeability is high even with a good many rams.

If mold hardness increases and levels out rapidly, molders may experience poor draws, and much mold breakage may occur where deep pockets are involved. By increasing the deformation with additions of western bentonite or cereal, this condition may correct molding trouble.

Flat-backs may show signs of rattails, buckles, or even scabs. Increasing deformation slightly may correct these defects, as the sand is prevented from over-ramming.

It is the authors' belief that ten rams may be sufficient to analyze a sand mixture, although some well-known foundries use more. The authors also believe that with ten rams on the specimen, green compression strength should gradually increase but not too sharply. Hardness should gradually increase, as should density. Permeability, on the other hand, should gradually decrease to about one-fourth of its original value at the end of ten rams (Fig. 4).

Acknowledgments

A number of foundrymen are cooperating with the authors in correlating laboratory properties and molding behavior. The authors acknowledge particularly the assistance of: C. A. Robeck, Gibson & Kirk Co., Baltimore; Robert C. Walker, Whitin Machine Works, Whitinsville, Mass.; Andrew T. Sproat, Chapman Valve Mfg. Co., Indian Orchard, Mass.; Thomas C. Alford, Wheland Co., Chattanooga, Tenn.; Jose Acebo, Ohio Malleable Iron Co., Columbus, Ohio; and John Juppenlatz, Lebanon Steel Foundry, Lebanon, Pa.

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▶ *Study and cooperation win new safety record*

Evidence that foundries can do more about accident prevention is the new safety record set by the Caterpillar Tractor Co., Peoria, Ill., whose safety director, H. S. Simpson, has just announced that the company is well on its way toward achieving the safest year in history. The record now stands at a frequency rate of 1.0 per million man hours of work in the foundry for the first eight months of 1952. This compares with 5.0 for the same period last year.

Compare this frequency rate with that of the foundry industry as a whole—the rate is 26.9—and you have the evidence that Caterpillar has an exceptional safety program.

Chief method used in achieving this safety record is the conducting of monthly safety meetings attended by all supervisors. A theme is established for each of these monthly meetings. For instance, during the past four months the themes have been "Machines, Tools and Material Handling", "Value of Wearing Personal Protective Devices," "Horseplay" and "Policing the Area." Theme for the current month is "Fire Prevention."

Mr. Simpson points out that Caterpillar's greatest safety problem has been that of material handling and storage. This has been the experience of many other foundries. Caterpillar is proving, however, that cooperation with the foremen and careful safety planning will prevent accidents in this as well as all other operations.

▶ *Building fund contributions keep coming to A.F.S. office*

With several disappointments over rezoning in the background, the search for a suitable location for the new A. F. S. headquarters building continues. Preferred site is expected to be found in some suburb northwest of Chicago. Meanwhile, contributions are still being received and original pledges augmented though active solicitation has ceased. Latest contributions are those of *Foundry* magazine, Cleveland, and Frank G. Steinebach, also of Cleveland.

An actual record of one hour's operation of a typical manually controlled Model "80" Speedmullor. Fifty 1-ton batches of synthetic molding sand were loaded, mulled to maximum physical properties, and discharged in this period.

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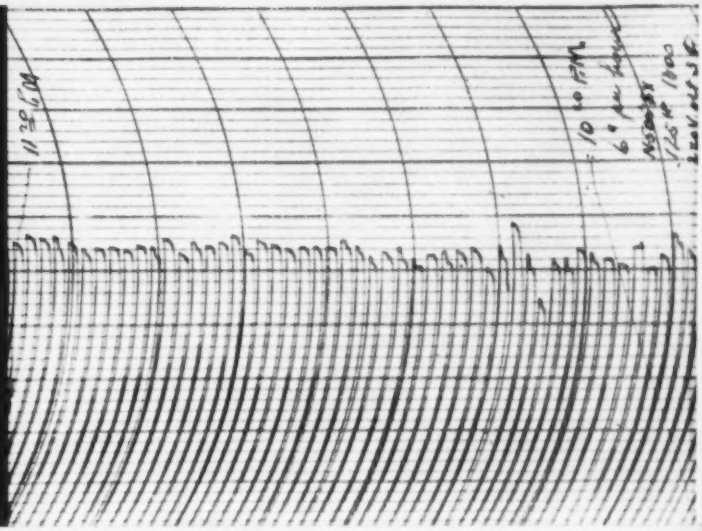

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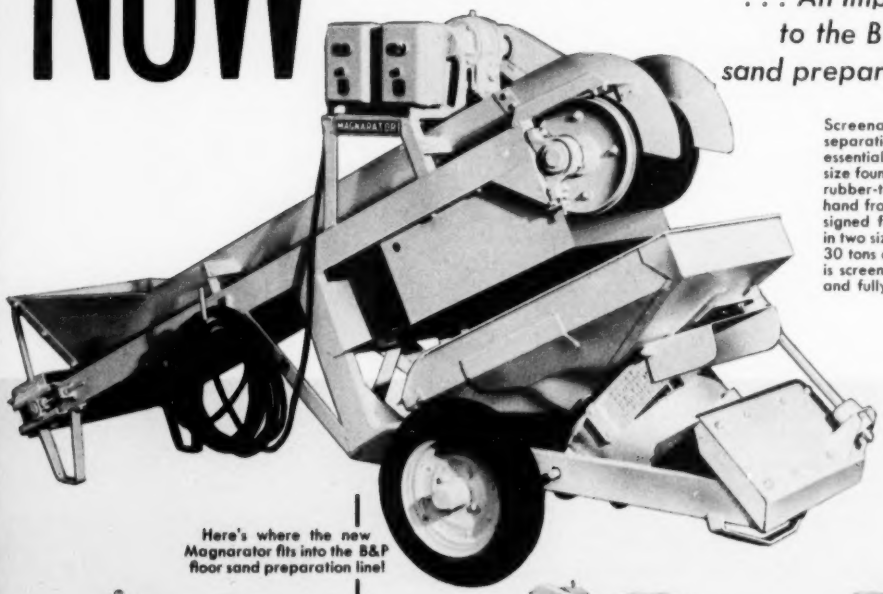

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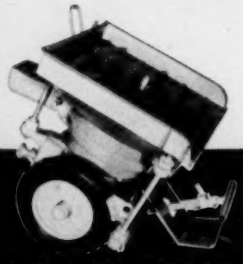

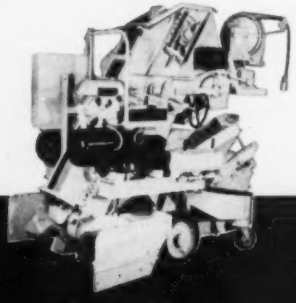

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LOOK TO
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FOR BETTER METHODS

They're molding cinder pots bigger and tougher than ever

Inspection of the latest cinder pots shows corrugated walls, sawed rim, and copper-coated bottom — a few of the features which give the modern "thimble" longer life. Here's a picture story that explains some of the reasons why such developments became necessary and how they have been achieved in the foundry operations of the Midland, Pa., plant of Mackintosh-Hemphill Co.

■ Cinder pots, or "thimbles," have a short life expectancy. They are the steel industry's only metal receptacles for molten material that are unprotected by heat-resistant refractory linings. Such linings are difficult to keep in place in pots that are emptied by tipping—besides, unlined pots hasten the cooling of slag. So the unprotected thimbles must take loads of slag at temperatures of around 2900 F — above the melting point of iron and steel.

Causes of pot failure

Other conditions have combined to shorten the anticipated service life of a cinder pot. One is the operation of furnaces over their rated capacities. When operated above nominal capacity, more molten metal is entrained in the slag. This metal adheres to the bottom of the pot. Violent methods are then required to break this fusion. Another cause of premature pot failure is the business of holding filled pots on cars until enough have accumulated to form long trains.

Demand for larger and larger cinder pots has been steadily developing. There are three principal reasons for this. First is the increasing use of low-grade iron ore which means more gangue or waste material per heat for disposal. Second, the almost universal use of oxygen in furnace operation makes the slag frothy and voluminous. The third reason is that transportation charges are generally based on the number of cars hauled rather than the number of tons of slag.

For these reasons, size has been increased until the capacity of some cinder pots now exceeds 500 cu ft. Many are made in an oval instead of round shape to meet clearance limitations of the railroad and furnace columns.

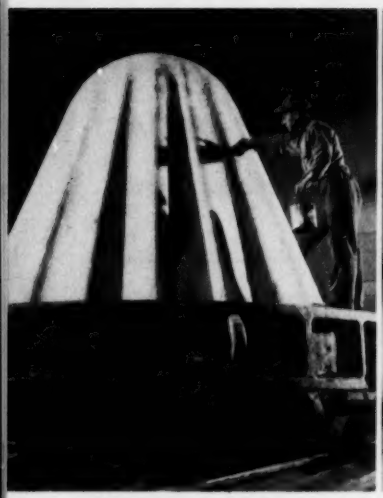
Making pots last longer

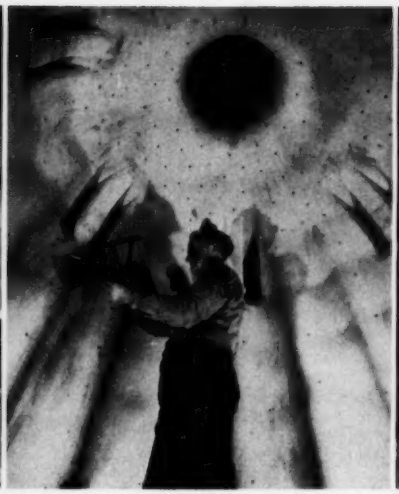
Yet, despite the beating they take and the greater capacities required of them, cinder pots today are lasting longer than ever. One reason for this is that many plants have improved operating practices and "house-keeping," eliminating the unnecessary abuse that shortens cinder

Taking slag at 2900 F, mounted cinder pot represents end product of economy-wise foundry planning and experience.

Checking dimensions of wooden pattern —they range up to 10 ft high and 11 ft in diameter for a 500 cu ft "thimble."

Silica facing sand is rammed around pattern in cope half of mold. Smaller flasks will be used above this level.





Silica wash is applied to molds before and after drying. Drag half stays in drying oven 36 hours. Cope half is dried by gas flames. Nail studs help prevent sand erosion.

Opening in dome is sink head for adding metal as casting cools. Metal flows through twin gates which feed in opposite directions at base of mold. Pouring time: 3 minutes.

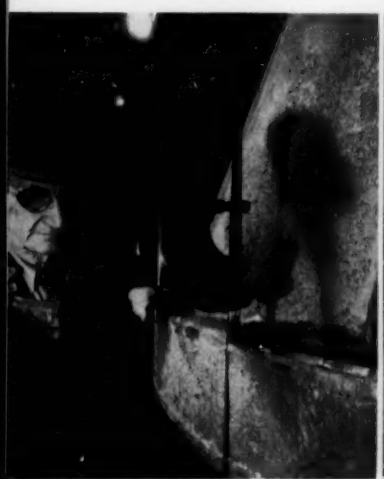
pot life. An even more important reason for longer service is the better design of today's cinder pots.

Cinder-pot history

Of course, the manufacture and growing use of corrugated steel cinder pots has developed over a period of years beginning as far back as 1934. It was recognized at that time that a cinder pot should be better able to withstand the severe thermal shocks both of receiving molten slag and of frequent drastic quenching action in snow or rain. The need prompted the designing of the corrugated cinder pot. Distortion in the middle third section of plain cinder pots was the most serious problem for which a solution was sought.

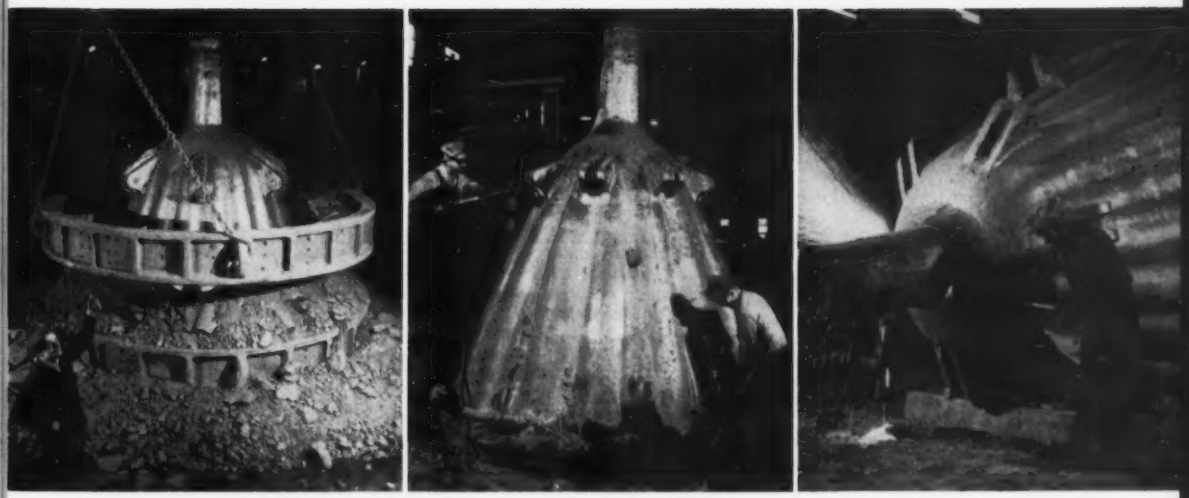
In 1935 a method was devised for measuring and determining the temperature, temperature gradients, and rates of heat transfer through and radiation from cinder pot walls. It was found that corrugations permit pot walls to expand and contract freely, and provide more surface for heat dissipation.

Other improvements of cinder pot design followed. In 1938 a new means of crane hook attachment to cinder



Rims are band-sawed at centers of corrugation to prevent permanent distortion during thermal expansion. Pots are then annealed about a week for internal stress relief.

Copper metallizing is then applied to bottoms of pots with oxy-acetylene flame. Coating makes dumping and skulling easier by preventing fusion of entrained metal.



Flasks are removed after 24-hour cooling period. Overhead traveling cranes do all handling on shakeout floor. Castings are rough cleaned with pneumatic chisels. Solidified gates are at lower left of cleaning photo. Riser and gates are burned off. Riser stub is hand-ground to contour. Large riser is needed to feed castings which weigh up to 50,000 lb.

pot lifting or trunion rings was developed to enable crane operators without assistance to safely handle and dump open-hearth cinder pots mounted on crane dump cars built especially for that purpose.

During the following year, in an effort to overcome tension in pot walls, a method of supporting cinder pots in bail rings was developed to supplant the almost universally used "feet." Lugs are cast near the bottom of the pot on the coolest and strongest part of the walls. Brackets that embrace the ring and support the pot by suspension are attached to these lugs.

Copper coating

Copper coating on the inside bottom portion of the pot was introduced in 1940. The coating makes dumping and skulling easier by preventing entrained metal from fusing with the bottom.

Expansible rims were first used in 1941 to keep the top of the pot in a true circular shape — an especially important development for open hearth work where hot cinder pots are transferred from the stands to the car for removal. The expansible rim prevents loss of fit in handling equipment.

Cradles for end-dump cinder pots were devised and, in 1942, considerable reduction of solidifying time in the open hearth department was accomplished by providing an air cooled base for open-bottom cinder pots.

Convex curved sides comprised the next cinder-pot improvement. This feature retards thermal inward creeping of the walls. It also avoids use of over-thick walls which tend to crack and check because heat radiation is retarded.

It is clear that foundry operations, like those of the Macintosh-Hemphill Co., have gone a long way toward giving the steel industry the sort of cinder pots it needs. The list of achievements is an imposing one.

Taken as a whole, these several developments permit the continual removal of slag economically, efficiently, and safely. Despite climbing tonnage and increasing distances of travel cinder pots are doing a better job than ever before.

Mounted on crane dump cars, cinder pots are emptied at slag dump by means of air cylinders which supply power for tipping them. Note the low supporting lugs— a feature designed to reduce strains in the walls of the cinder pots.

Practical solutions to production problems

Provided by consulting team

KENNETH MACKAY SMITH / *Foundry Manager and Consultant, Cranston, R. I.*

Foundrymen are familiar with the productivity teams which have visited this country and many have played host to overseas visitors interested in learning details of our production methods. Not so familiar are the teams of consultants from the United States which spend six to 12 months in various European countries passing on production know-how under the Mutual Security Agency. This story tells how the author and his team mates solved typical problems in molding sand, mechanization, and cupola operation for Italian foundries.

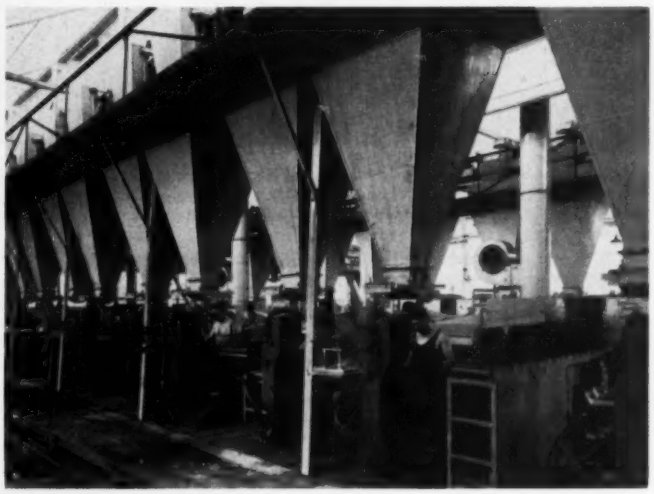
■ Thirteen major Italian foundries put up money to help pay for the aid they received from a 6-man team which spent nine months studying their problems and advising in their solution. Castings made by the 13 included machine tool, automotive, farm equipment, ice machine, malleable pipe fittings, marine diesel, ingot molds, turbines and pumps, centrifugal cast pipe, ship building, sewing machine, boiler, textile, radiator, stove plate, and machine beds and bases up to 60 tons.

Before the team was made up, the 13 answered a questionnaire prepared by the Italian Foundrymen's Association, Milan, to determine their major problems which in turn determined the make-up of the team. Team headquarters were in the offices of the association in Milan.

Conversion problems

The team was called on to make recommendations for sand mixtures for many types and sizes of castings. This required not only a language translation but also developing familiarity with test results obtained in metric units and conversion factors to convert to the English units which we commonly use. One sand problem, which required consideration of the greatest number of properties, was in a foundry producing diesel engine blocks, tractor bodies, flywheels, and motor blocks.

Large jolt-rollovers were used with slingers on a highly mechanized system. A system sand with no facing was used, followed by a water blacking spray and a fast skin dry. The synthetic sand used caused rough surfaces on all castings except flywheels, a high percentage of expansion scabs and rattails, and some washes traced to low dry strength. Green compression strength as high as 17 psi accounted for rough vertical surfaces because of low flowability. Dry shear ran 8 to 10 psi; a standard sample weighed 145 grams.



Better arrangement, small investment, changed low productivity line like this . . .

How a sand with such high green strength could produce expansion scabs and rattails was shown by investigation. Base sand was a round-grain silica sand with a 3-screen spread and 50 per cent on the high screen. The clay was entirely bentonite, about 7 per cent. Carbonaceous material ran about 2½ per cent because no sea coal was used. From experience, we know this combination would have high expansion properties at elevated temperatures.

No dilatometers were available to us and the team found no commercial sand laboratories in Italy. The company, the largest in Italy, has made plans to add this piece of apparatus to its already well-equipped laboratories.

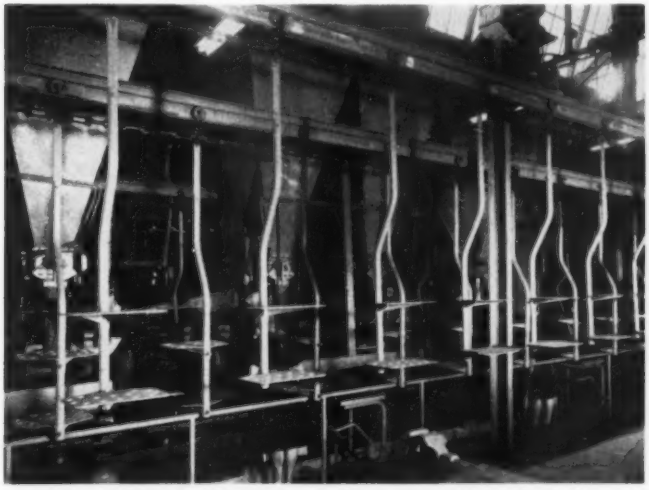
Sand requirements

Production had to wait until a suitable sand could be developed so the author took time out to check on sand deposits, both natural and base silica sands. Luckily, within 75 miles of the plant there was a good-sized deposit with several grades of subangular silica sand. Each grade had a 4- to 5-screen spread and no screen held over 35 per cent. The sand ran between 90 and 95 per cent silica. Further investigation did not disclose any other area in Italy with silica sand that approached these qualities.

There are few deposits of refrac-

tory natural sand in Italy. For best results these have to be used in combination because their grain distribution is limited to two screens or is at the other end of scale on seven or eight screens. Many natural deposits have very poor properties, and foundries using them must pour at low temperatures, suffering many casting defects. Since the use of synthetic molding sand is spreading in Italy, the deposit referred to will help the industry greatly.

Suppliers of sea coal were contacted and convinced that they should produce several grinds. A



. . . into modern loop like this with over double the capacity though fewer workers.

little difficulty was experienced in securing wood flour ground from hard wood. Cereal binders and dextrin were plentiful. For increasing dry strength and hot strength, molasses and sulphite liquor were used in place of the highly expensive ground pitch.

Good quality and production could be achieved if the new sand mixture had high flowability. Therefore, green compression strength was set at 7 to 10 psi. Base sand with an A.F.S. Fineness of 60 to 70 was chosen and experiments were started using all new sand. Drawing from experience with low strength sands, the author decided to ward off expansion problems by using 9-12 per cent clay plus a maximum of 8 per cent carbonaceous material determined by the burnout method.

To maintain green compression strength between 7-10 psi with 9-12 per cent clay necessitated the use of a combination of bentonite and a weaker clay. The amount of each was determined by the control of green strength and total clay within the predetermined figures. For the first experiments, 1 per cent wood flour, one-half per cent cereal binder, and 5 per cent sea coal were used. The grade of sea coal which most closely approached the sand distribution was chosen. All figures are by weight. Moisture was set at 5.5 to 6 per cent above optimum purposely to aid dry strength.

Casting results were excellent. The first castings did not have the benefit of the amount of sea coal quoted; but as more difficult castings were used for tests, the amount of sea coal was increased until it reached 5 per cent. To learn what daily changes in mixture were necessary to convert the all new sand mix to a fairly stable unit sand, enough of this new mixture was segregated for a 2-weeks trial. Each night the test castings were shaken out, and the sand used for the following day's mix. At the end of the two weeks the author recommended that all the sand in the unit (150 tons) be discarded and the new sand substituted in its place. Over a week-end, this was accomplished.

Again the start was made with all new sand. After a short period, additions became fairly stable and the system now uses 96 per cent return sand and only 4 per cent daily addition of new sand. Additions of clay, sea coal, cereal, and wood flour are very small. The sand is working extremely well in the slinger. Expansion scabs and rattails on the castings on this unit are almost unheard of today, and total scrap is much lower. Production has increased and vertical surface quality is excellent.

Production bottlenecks

In Italian mechanized foundries, small castings are made on cope and drag machines which invariably have been placed 8 to 15 feet away from the loop conveyor. In most cases there are two lines of roller conveyor running from each machine to the loop conveyor. One line is for empty flask return and the other for finished mold halves. Steel or cast iron flasks are used which run in size up to about 16 x 16 x 6 inches. In one foundry, women closed the molds on one line and the limit on size was much less. The author investigated this molding system and made recommendations for changing it. Immediate action was taken by the company which was progressive and exceptional in many ways. Here are some of the details.

In the old system, four people were used for each pair of molding machines. Two men—a cope molder and a drag molder—made the molds. Two women set cores, closed molds, and moved empty flasks from the mold loop conveyor to a place on the empty flask roller conveyor near the molders. At the time the team visited this plant, each pair of machines produced an average of 100 molds per hour or 25 molds per worker. Mulled sand was supplied by hoppers over the molding machines. As may be judged by the description, the two women used more energy on their part of the cycle than did the two men. A one-man snap flask operation using only one molding machine will produce many more than 25 molds per hour, so the four-operator method was examined thoroughly. Time studies confirmed that considerable time was lost because of the distance walked by the two women in performing their operations.

The foundry was a captive production foundry, highly mechanized so it was possible to consider three ways of increasing production and shop capacity at a lower unit cost. Because the type of castings was particularly suitable for the stack molding process, this method had to be considered. The castings were also a natural for snap flask molding.

These two methods would be costly because in each case one or more of the following items of equipment would have to be replaced: flask equipment, pattern equipment, molding machines, molding loop, or pouring system. In each case, the workers would have to learn an entirely new method of molding.

Modify cope-and-drag

The third way was to improve the cope and drag method. The author offered to run a simple experiment which would indicate the possibilities in production and cost reduction. Arrangements were made to run the experiment the following day. The purpose was to show the effect of having the mold loop conveyor moved to within 14 inches of the line of molding machines which would be repositioned under sand hoppers to face 90 degrees from the loop conveyor. A separate flask return conveyor would carry flasks within inches of molders on the side of the machines opposite from the mold conveyor. The molders would perform all operations except core setting.

For the experiment, molds without cores were chosen and roller conveyors were placed in the positions recommended for mold and flask conveyors. Two workers were used instead of four. The experiment ran for about six hours. Average production for the six hours was 118 molds per hour (59 molds per worker per hour), and the best hour produced 150 molds (75 molds per worker per hour).

The experiment was barely finished before the company made its decision. Plans for the new system were rushed and dismantling started immediately. The total cost approximated $7,000. The crew now consists of the two men machine molders and one woman for core setting only. When coreless molds are made, the woman moves to another set of machines. Top production on the loop for cored molds would exceed 65 molds per worker per hour, but the company prefers to reach the goal in stages.

Plans have been made to change other loops to the newer method. The "after" photographs show the remodeled loop. Weight shifting devices will be installed soon. No "before" pictures were available of the old loop before dismantling, so the "before" photograph shown is of one of the other loops which is similar to the one replaced and which will be changed. Note that the hanging core conveyor was also a feature of the old method. The new loop is not unfamiliar in the United States, but it is probably the first in Italy.

The team, consulted regarding plans for new foundries mechanized for small mold production, found it a little difficult to convince managements that they should avoid the older type of molding loops. There was no evidence of snap flask molding and we were unable to do more than promote interest in snap flask molding. There was not sufficient time in any one shop to set up the necessary equipment and train the personnel.

Mold conveyors at 90 degrees from molder position and only 14 inches away from machines saves the walk of eight to 15 feet which is common in Italian foundries.

Problems of quality, cost, and control in cupola melting have raised several questions in the minds of Italian foundry management. One large foundry does all of its melting in three 15-ton electric furnaces and two holding and refining furnaces, and claims more economy of operation, as well as control, over temperature and quality. Electric rates are low, but cupola coke is much higher in price than in the United States. Duplexing, hot blast, and basic cupolas are also receiving much attention.

The highest spout temperature observed on an Italian cupola, checked by optical pyrometer, was 2642 F. In most shops readings rarely exceeded 2588 F. Some Italian engineers claim a differential of 100 F between their instruments and those in the United States, which would make their high figure 2742 F. Because we had no way of making a true comparison, it was decided to forego absolute accuracy and accept our judgment that spout temperatures were noticeably lower than those of United States cupolas.

We cannot discuss metal temperature without bringing in molding sand quality, because most of the foundries except the light casting shops reduce pouring temperatures according to the ability of their particular sands to withstand the thermal shock. To melt at higher temperatures in these shops certainly is beneficial, but to do so without the advantage of higher pouring temperatures does little to solve the problems of gas and slag inclusions, expansion scabs, and feeding properties.

Cupola variations

It is hoped that the work of the team on sand properties in the 13 foundries has given new impetus to solving the melting and pouring problems. In these shops, emphasis was placed on solving the sand problems before taking advantage of higher pouring temperatures.

The most noticeable difference between cupolas in America and those in Italy is that Italian cupolas practically all have a deep well. Many

of them employ tuyeres which slant downward, and tuyere design varies considerably. Well depths of 18 inches from bottom of tuyere to sand bottom were observed. The tendency to bosh was not nearly as prevalent as in America. Cases of a reverse bosh above the tuyeres were observed and called for immediate corrective action by the team.

Reasons for the deep well are evident when raw materials are considered. More care is required during the light-up of a deep-well cupola, and the team helped several foundries overcome cold iron on the first two or three taps.

Wood was commonly used to light up. Coke in the well often was poorly lit, and considerable time elapsed before natural draft through the tuyeres ignited the coke above the tuyeres. One foundry experienced tap hole freeze upon the second tap on many occasions. The period between light-up and blast-on in this case was 5½ to 6 hours. By that time the heating value in the lower bed coke was considerably wasted. Insufficient wood of a large cross section was the indirect cause of the slow light-up.

Light-up experiments

Two methods were offered for overcoming the problem. One was to use sufficient wood of about 2 x 3 in. cross section to ignite coke above the tuyeres. The other was to use natural draft or compressed air through breast and slag hole openings to aid the ignition of coke in the deep well. The first experiment with the 2 x 3 in. wood reduced bed burning time to 2½ hours. Bed coke was charged in increments of one-third, with inspection for burn-through before each addition.

The results were gratifying, not only on temperatures of the first taps but on subsequent taps as well. This indicated that the old method was causing a low bed condition which affected as much as half the heat on short heats.

The coke splits in the average foundry were 10 to 12 per cent of the metal charge. Several foundries used iron charges greater in weight than recommended for the cupola size involved. To correct this, the team used the method of determining metal charge weights by the weight of coke in a ring the diameter to the inside of the cupola and 6 inches in height. Some allowance was then made for coke quality. From the weight of the coke charge, the weight of metal charge was determined by the best performance of iron to coke ratio. With temperature and quality a problem, the main emphasis could not be on economy of operation.

The next subject of investigation was the evidence of oxidation in many foundries. Tuyere ratios of 25 to 35 per cent seemed proper and blast volumes were in line. But the slags of many cupolas were quite black. In no case did riser tops show the honeycomb or mushroom effect of badly oxidized iron. High blast pressures provided a clue, and two reasons were found. Quantities of small steel and cast iron scrap was one; a large percentage of very small pieces of coke was the other. A drive on eliminating small coke was made in every foundry.

Set cupola controls

Recommendations were made to cover all the phases of cupola practice. Supervision and controls were emphasized because details of cupola operation often had been left to the unqualified. This seemed a strange contrast to the beautifully equipped laboratories of the larger companies.

We succeeded in raising spout temperatures as much as 75 degrees F, and in reducing the signs of oxidation but are not entirely satisfied that more cannot be accomplished.

Italy has difficulty acquiring coals suitable for the production of high grade coke. Sulfur content ran as high as 1.4 per cent. High ash, low carbon, cell structure, density, and grading by size are unsolved problems. These, and problems concerning pig iron specifications, were brought to the attention of the Italian foundry association for further action.

Italian foundrymen rely on the deep well of the cupola to help in their coke and pig problems. The well holds three or four charges. When small quantities or iron are taken in pouring ladles, the deep well minimizes the variations in purchased scrap and pig iron. Examples of extremely wide variations wer found through analysis of individual pigs within a carload.

When large quantities of iron are desired the deep well is relied upon for higher metal temperature in the ladle by holding as much metal as possible in the well instead of the ladle. A cupola with a nominal well depth would require four taps to produce as much metal as the deep well cupola does in three taps.

The team took the position that only after standard cupola practice has been utilized to its full potential should consideration be given to other methods of melting. In some foundries, duplexing, hot blast, or electric furnace melting would be advantageous. In others the advantage is questionable if proper consideration is given to the principles of standard cupola practice.

Prospects good

After spending nine months with the Technical Assistance Div. of M.S.A. the team was convinced that Italian foundries can at least approach the productivity of the United States shops. To do so, problems not discussed in this article require solution. Some of these cannot be cleared up by an individual company, but rather require solution by the whole industry, and in some cases by the Italian government. These become long-range objectives to be achieved step by step. The team also found much that could be done immediately with the material already at hand.

Team members found Italian top management, technical men, and supervision to be intelligent and industrious. With more obstacles to overcome than foundrymen in the United States, they are making excellent progress. The Italian skilled worker is energetic and a fine craftsman in all trades.

▶ *To visit Italian foundries on "Paris in '53" tours*

American foundrymen and their ladies will have the opportunity to inspect Italian foundries during one of the two European tours which have been arranged in conjunction with the International Foundry Congress which convenes in Paris September 20-27, 1953.

The post-Congress tour (Tour "Green") beginning with the Paris International will allow about 40 days for trips to France, Italy, Switzerland, Germany, Belgium, and England. About 12 or 13 days will be spent in Italy, with visits to Florence, Rome, Venice and the industrial center of Milan. Here plant visits will be arranged by the Italian Foundry and Metallurgical association.

More than 280 reservations already have been received for the two tours at A.F.S. headquarters. Possibility of limiting the number of reservations for each has been considered. If the demand warrants it, a third tour may be arranged.

Study management problems at meeting of *National Foundry Association*

E. J. WALSH / *Executive Secretary, National Foundry Association, Chicago*

■ Members of the National Foundry Association met for their 54th annual convention September 18 and 19 at the Edgewater Beach Hotel in Chicago. Talks and discussions covered a broad field of management topics.

NFA President A. V. Martens, Pekin Foundry & Mfg. Co., Pekin, Ill., opened the meeting by recalling the early days of the association. It is continuing along the lines originally set up in 1898, he said, but has expanded to settle new problems as they arise. He referred to the work of NFA in the field of legislation, labor contracts, and related management fields in which the association has been especially active.

Second speaker was Wm. N. Davis, director of the Safety & Hygiene & Air Pollution Program for the American Foundrymen's Society, Chicago. In introducing Mr. Davis, NFA President Martens said the S & H & AP Program represents the most significant work undertaken for the foundry industry.

Best safety device

The best safety device is a careful worker, Davis declared, pointing out that 85 per cent of all accidents are due to human failings. Hidden costs of accidents are four to seven times the direct costs, he stated. A safety-trained foreman is the key man in a good safety program, but he needs management backing, the speaker said, in outlining methods of organizing a program for plant safety.

(EDITOR'S NOTE: Mr. Davis' entire talk appears in this issue of AMERICAN FOUNDRYMAN starting on page 42.)

George W. Mitchell, Federal Reserve Bank, Chicago, spoke on *"Economic Conditions and Business Prospects."* He reviewed the various indices of business activity—employment, production, disposable income, adjusted prices, and corporate profits—and said that prospects for continued inflation are all due to actual war, possible war, or the aftermath of war. Chances for deflation in the more distant future, Mitchell said,

W. Summerfield Brunk

are alarming, and depend on filling the gap when consumer, business, or government demands subside.

Luncheon speaker was Senator Everett M. Dirksen, Illinois, who took the occasion of the 165th anniversary of the completion of the Constitution to discuss its development and meaning.

James J. Reynolds, U. S. Pipe & Foundry Co., started the afternoon session with a talk entitled *"Government Participation in the Field of Labor Relations."* He traced the development of government in labor relations, stating that government must play a minimum role if free labor relations are to survive.

"The Country is not Going to Hell —Just Through It" was the topic discussed by Phil S. Hanna, *Chicago Daily News* financial and business editor.

Officers of National Foundry Association for the coming year were introduced at the end of the day. They are: W. Summerfield Brunk, Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, *president;* W. W. C. Ball, Taylor & Fenn Co., Hartford, Conn., *vice-president;* and E. B. Sherwin, Chicago Hardward Foundry Co., North Chicago, Ill., who continues as treasurer. Edward J. Walsh was reappointed executive secretary.

The morning of the second day was devoted to a labor-management panel discussion. On the panel, moderated by Clarence M. Updegraff, University of Iowa, were: H. W. Story, Allis-Chalmers Mfg. Co., Milwaukee; C. Wayne Brownell, Packard Motor Car Co., Detroit; Clinton S. Golden, Harvard University, and Edward J. Fillenwarth, Indianapolis attorney.

The 1952 annual meeting of the National Foundry Association concluded with a luncheon at which Clarence Manion, Doran & Manion, addressed the group on *"The Key to Peace."* He drew on his long experience in constitutional law to discuss the importance of voluntary control.

▶ *FEF president appoints 19 to industrial advisory committee*

Marion J. Allen, American Steel Foundries, Chicago, president of Foundry Educational Foundation, has appointed an advisory committee to work with Illinois Institute of Technology during the current academic year. H. A. White, Smeeth-Harwood Co., Chicago, is chairman. Other members are: Mr. Allen; S. S. Howe, E. C. Kubicek, D. W. Levinson, L. F. Mondolfo, Otto Zmeskal, all of Illinois Tech; Gordon Johnson, Armour Research Foundation; Lester B. Knight, Lester B. Knight & Associates, Inc.; G. L. Larsen, Crane Co.; C. V. Nass, Pettibone Mulliken Corp.; G. P. Phillips, International Harvester Co.; F. D. O'Neil, Western Foundry Co.; L. D. Pridmore, International Molding Machine Co.; E. A. Rich, American Wheelabrator & Equipment Corp.; James Thomson, Continental Foundry & Machine Co.; L. J. Wise, Chicago Malleable Castings Co.; B. C. Yearly, National Malleable & Steel Castings Co.; and W. R. Tanner, Zenith Foundry Co.

Cupola deoxidation improves iron casting machinability

F. S. KLEEMAN / *Consulting Engineer, Pittsburgh*

Iron castings often must undergo many machining operations before they are ready to be incorporated in final assemblies, the cost of machining usually amounting to more than the castings themselves. In this paper, given at the 1952 Southeastern Regional Foundry Conference, Birmingham, Ala., the author suggests improving machining qualities by a melting deoxidation process using briquettes of silicon carbide.

■ The vastly increased demands for machining facilities has led to a serious shortage of machine tools which threatens to seriously hamper the defense program. In the face of this situation, it has become increasingly necessary and important to utilize any and all possible means for breaking this bottleneck.

One important possibility for increasing machining production with present facilities consists of a melting deoxidation process which can be utilized in foundries to obtain iron castings with superior machining qualities. The process involves use of a briquetted deoxidizer which may be added to the cupola charge and which is effective in deoxidizing the iron during melting so that the metal produced is brought to a controlled level of deoxidation. The deoxidizer used consists principally of a specially prepared grade of silicon carbide, and production experience has demonstrated that its deoxidizing action serves to regulate the nature and distribution of the microconstituents of the metal structure so effectively that sound castings may be consistently produced with optimum strength and machinability characteristics.

What gives machinability?

To achieve maximum production at minimum machining cost, casting specifications usually include both strength and hardness requirements. While hardness testing has customarily been employed to predict the machining performance of iron castings, it is becoming more widely recognized that this test does not give a sufficiently fundamental measure of

TABLE I — EFFECTIVENESS OF CUPOLA DEOXIDATION PROCESS

Comparative Heats	% Oxygen in Metal		% FeO in Slag	
	Cupola Deox.	Not Deox.	Cupola Deox.	Not Deox.
1506-1 and 1506-2F	0.0016	0.0072	4.08	6.76
1506-3F and 1506-4	0.0022	0.0027	6.04	10.07
1506-5 and 1506-6F	0.0020	0.0036	9.63	13.20
1506-7 and 1506-7F	0.0027	0.0058	3.73	9.20
1506-1 and 1506-9F	0.0019	0.0022	4.36	6.76
Average	0.0020	0.0030	5.57	9.21

Table 1 . . . Test results show that cupola deoxidized irons are consistently lower in oxygen in metal and iron oxide in slag than non-deoxidized irons.

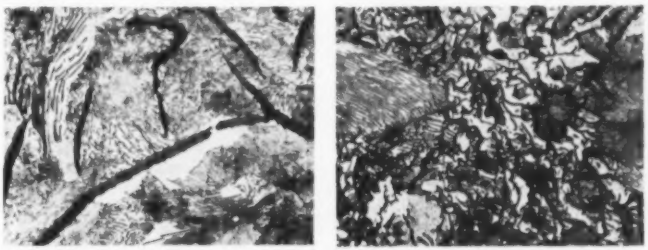


Fig. 1 and 2 . . . Same Brinell hardness, different machinability. At left, deoxidized gray iron has Brinell hardness of 187 with machinability index of 3.0. At right, non-deoxidized gray iron (same base) has Brinell hardness of 185 and a machinability index of 1.5. (Both X500)

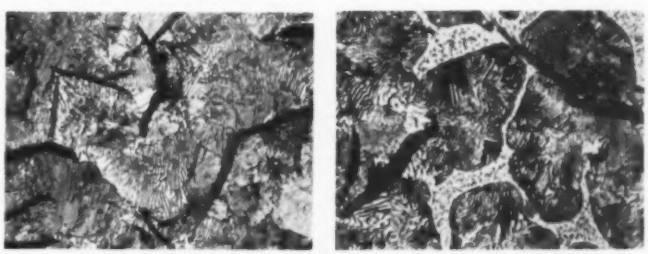


Fig. 3 and 4 . . . Same machinability index, but different Brinell hardness. At left, deoxidized gray iron has Brinell hardness of 218 with a machinability index of 1.0. At right, non-deoxidized gray iron has Brinell hardness of 195 with the same machinability index of 1.0. (Both X500)

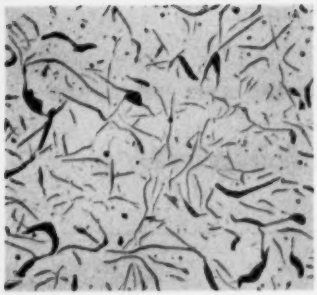


Fig. 5 . . . Cupola deoxidized gray iron shows random graphite dispersion, good machinability. (X100)

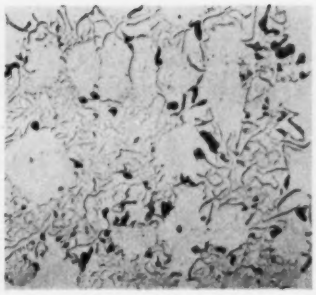


Fig. 6 . . . Same base iron shown in preceding figure, but not deoxidized, shows graphite segregation. (X100)

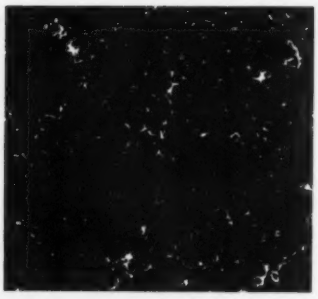


Fig. 7 . . . Cupola deoxidized gray iron shows dispersed carbides, again lending good machinability. (X100)

machining properties and thus is not entirely reliable for control purposes.

The machinability of a casting is determined by the nature and distribution of the microconstituents which comprise its structure. Thus, while hardness testing will, no doubt, continue to be valuable for production control of machinability in the foundry, it seems sensible that this test should be augmented by frequent microexaminations of the metal structure to which machinability is more directly related.

Support for this belief is afforded by the iron structures illustrated in Fig. 1 to 4, which show pearlitic cast irons of similar Brinell hardness which vary widely in machinability, and also irons with considerable variance in hardness that show the same degree of machinability. Each of these typical gray iron structures has been assigned a tool life index number in accordance with the method given in the 1950 U. S. Air Force Machinability Report, which arbitrarily assigns a value of 1.0 to a 218 Brinell, fine pearlitic iron which is free of segregations. According to this method of rating machinability, the tool life index number of a gray iron structure consisting entirely of ferrite and graphite is 20.0, while that of white iron (iron carbide) is practically zero.

For high strength pearlitic irons, such as those used in the automotive industry, the tool-life index numbers ordinarily range from 1f0 for a 2.18 Brinell fine pearlitic structure to 2.0 for a 1.95 Brinell coarse pearlitic structure. It is obvious, of course, that improved machinability is indicated by an increase in tool-life index number.

The frequent lack of correlation between machinability rating and Brinell hardness value of grey iron structures appears to result from variations in the degree of segregation of the metal microstituents, since segregations may greatly influence machinability and yet scarcely be detected by the usual hardness measurements. Segregations of iron carbide, steadite, or other hard aggregates, for example, often cause hard spots which materially reduce tool life during machining. If these constituents occur in similar proportions but in random distribution, the metal hardness usually remains unchanged while the degree of machinability is substantially improved.

Explains poor machinability

The effect of such segregation is illustrated in Fig. 1 and 2, which show gray irons which are similar in structure except for the segregation of graphite in the structure shown in Fig. 2. This segregation of graphite probably accounts for the inferior degree of machinability of this structure as compared to that shown in Fig. 1 which has approximately the same Brinell hardness. Also, the 1.95 Brinell structure of Fig. 4 would normally be expected to have a higher tool-life index number than the 2.18 Brinell structure of Fig. 3. The fact that it does not is therefore attributed to the occurrence of the 5 per cent of segregated steadite which exists in this softer structure.

Microconstituents of iron casting structures, in order of decreasing machinability, are graphite, ferrite, coarse pearlite, fine pearlite, acicular structure, steadite (iron phosphide), and cementite (iron carbide). When the latter two constituents predominate in the microstructure, the castings become extremely difficult to machine, particularly if they occur in continuous segregated bands or networks throughout the metal structure. Similarly, the best machining metal structures are relatively free of segregation, with all microconstituents being randomly dispersed.

Controlled cupola deoxidation in the manufacture of iron castings serves a double purpose in facilitating machinability. First, it promotes formation of the easiest machining microconstituents consistent with the strength characteristics of the iron, as determined by its chemistry. Second, and probably more important, it serves to disperse all of the microconstituents into the random configurations which are known to assure best machining properties.

The value of deoxidizing iron in the cupola to obtain structure control and reduce chill and segregation has been recognized for many years. The improvement in machinability of gray iron obtained by this cupola deoxidation process has also been demonstrated many times in recent years. Accurate correlation of structure control with machinability of iron castings, however, has become possible only as more reliable methods have been developed for evaluation of relative machining properties.

Credits cupola deoxidation

The effectiveness of the cupola deoxidation process in reducing segregations of graphite, cementite, and steadite is illustrated in Fig. 5 to 10. The conclusion that the structural improvements obtained are the result of deoxidation is substantiated by the fact that the cupola deoxidized irons consistently show reduced oxygen contents and the cupola slags are consistently lower in FeO content (as demonstrated by test results given in Table 1) obtained on experimental cupola heats by a well-known research organization. These results show undeoxidized heats to have 50 per cent more

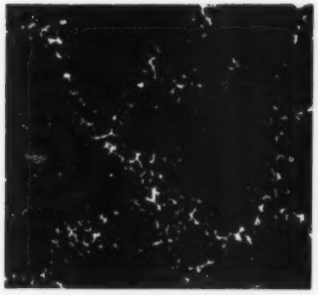


Fig. 8 . . . Same base iron shown in preceding figure, but not deoxidized, shows segregation of carbides. (X100)

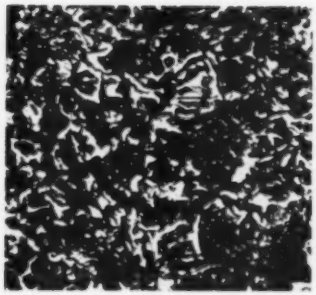


Fig. 9 . . . Gray iron here has been deoxidized in the cupola, resulting in steadite dispersion. (X100)

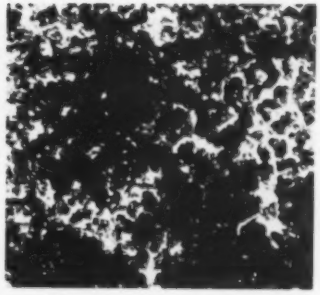


Fig. 10 . . . Same base iron as in Fig. 9, but not deoxidized, shows strong segregation of steadite. (X100)

oxygen in the metal and 65 per cent more iron oxide (FeO) in the slags than cupola deoxidized heats.

Various machining tests, such as were reported at a recent ASM symposium on machinability, have demonstrated conclusively that if the hard constituents of the microstructure are small and dispersed they interfere less with the tool during machining than when they occur in massive or continuous formations. Since the hard carbide and phosphide constituents range from 500 to 700 Brinell hardness, it is readily apparent that a reduction in their amount and degree of segregation will serve to increase tool life substantially and permit higher machining speeds.

Machining test data

Indicative of the wide diversity of casting machining properties which production tests have demonstrated to be improved by the cupola deoxidation process are the following examples taken from a variety of industries.

One company, in producing a 950 lb power cylinder for a large gas engine, was able to increase the machining speed of a turning operation from 50 to 66 sfpm by deoxidizing the iron in the cupola. In another case, a manufacturer of soft iron castings for the automotive industry was able to increase tool life by 35 to 40 per cent at constant machining speed. The tool life data were obtained from a month's run of castings produced from cupola deoxidized iron as compared to the previous practice without deoxidation.

A large automotive company had difficulty machining motor blocks cast from iron containing 2.50 to 2.60 per cent silicon and inoculated with silicon, graphite and other proprietary inoculants. Through cupola deoxidation they were able to eliminate the machining difficulties. With this deoxidized iron they were able to increase substantially the steel content of the metal mixture and still obtain good machinability.

Another foundry, troubled with hard spots in the surface of automotive castings, employed eleven men in the grinding room just to remove them. With cupola deoxidation, they were able to eliminate practically all such grinding. The castings were then sent directly to the machine shop and machined without difficulty. With the deoxidized castings, they obtained a 35 to 40 per cent increase in tool life on a finish boring operation and the machining speed was increased from 270 to 330 sfpm.

Still another manufacturer of automotive castings, after changing to deoxidized iron, ran the Brinell hardness at a slightly higher value, raising the tensile strength of the iron by 2000 to 2500 psi and thus produced a stronger, denser, and more wear resistant iron with far better machinability.

Several manufacturers of grey iron fittings have been able to eliminate the necessity for annealing by deoxidizing the iron in the cupola. Machinability of the unannealed deoxidized iron is often better than the previous iron after annealing.

One plant reports 1.62 tons of cupola-deoxidized castings machined per tap. Another plant increased tap life from 350 castings to 500 castings by replacing the regular iron mixture with cupola-deoxidized iron made from pure scrap. A third plant reports a 50 per cent decrease in die wear in threading plugs and other cupola-deoxidized gray iron fittings.

Foundries troubled with poor machining due to excessive chill in the castings have also been greatly helped by cupola deoxidation. One large electric manufacturer, for instance, reported that a prolonged study had shown that by deoxidizing their iron they can run on a harder base iron, with chill tests showing deeper chills, and yet obtain unusually good and uniform machining results.

Another plant employing cupola deoxidization now finds that its castings are readily machinable, even at low carbon contents which were formerly found to be unmachinable.

A third company reports that it is running its cupola-deoxidized iron at twice the chill depth on the chill test, as compared to that of the previous unoxidized iron. The castings from the stronger, denser iron are still drilling and machining as well as the previous, softer, undeoxidized iron.

A fourth plant stated that cupola deoxidization has increased the machinability of its chilled car wheels by about 25 per cent. This has prolonged tool life to such an extent that sizable savings in tool cost have resulted.

Scientifically controlled drilling tests made on cast iron pipe deoxidized with cupola briquettes indicate a 6 per cent reduction in drilling time as compared to that of the undeoxidized iron. Another cast iron pipe manufacturer, troubled with high percentage of pipe which could not be drilled after annealing, found that drilling troubles disappeared after the iron was cupola deoxidized.

A carefully controlled investigation of machinability was recently conducted by Mellon Institute of Industrial Research, Pittsburgh, in collaboration with Cincinnati (Ohio) Milling Machine Co. during which a large number of individually cast rings of similar chemistry were obtained at a large automotive found-

ry. The rings were 9 in. OD by 7 in. ID and ½ in. thick. Half of these rings were cast from iron melted without deoxidation and the other half were deoxidized in the cupola. The desired composition in all the specimens was 3.35 per cent total carbon and 1.80 to 2.00 per cent silicon content.

Test on cast rings

The comparative machinability of the two sets of samples, which were of the same average chemical composition, was determined at Cincinnati Milling Machine Co., using a tool life test devised by them and which has been demonstrated to give reliable results that correlate well with production experience. The non-deoxidized samples had an average carbon equivalent of 4.17, the deoxidized samples 4.15.

This machine test utilized an engine lathe provided with a special chuck which gripped the rings around the periphery. The inner and outer cylindrical surfaces of each ring were ground to permit smooth entry of the tool across the work surface. The special chuck was carried in a three-jaw chuck attached to the spindle of the lathe. A test ring was clamped in the chuck and cuts were taken alternately on the cope and drag faces with a carbide tool. No test ring was machined on both faces in the same test, averaging out any individual differences between test rings and faces.

Single-point Carboloy Grade 44-A tools were used and were ground with a 30° x 0.025-in. chamfer on the nose, the form found best in practice tests. Surface roughness on the ground tool was 7 to 8 micro-inch. The tests were conducted at three machining speeds of approximately 150, 200 and 300 sfpm in order to obtain cutting speed vs. tool life data. A nominal depth of cut of 1/16 in. was used with a feed of 0.010 in. per revolution.

The flank wear on the tool after each cut was measured by a 100-power microscope at a location 0.005 in. from chamfer. The tool wear was thus determined and expressed in terms of the cubic inches of metal removed in producing a uniform wear land of 0.005. Tests conducted to this degree of tool wear were found to be convenient to perform and gave results which correlate well with those run to a full 0.030-in. wear land, which represents complete failure for carbide tools.

The results obtained on comparable deoxidized and non-deoxidized sets of test specimens are presented graphically in Fig. 11. It will be noted from the graphs that the superior machining properties of the deoxidized irons becomes increasingly apparent as the machining speed is increased. For instance, the improvement at 150 sfpm was 12 per cent, at 200 sfpm it was 34 per cent, and at a machining speed of 300 sfpm the improvement resulting from cupola deoxidizaation was approximately 150 per cent.

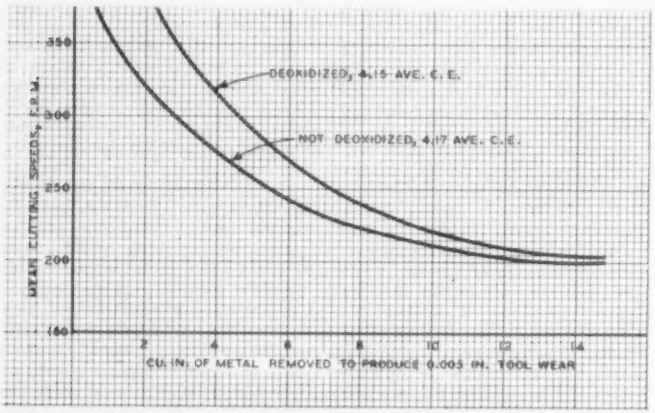


Fig. 11 . . . Tool life tests made by Cincinnati Milling Machine Co., Cincinnati, show that the superior machining properties of deoxidized irons becomes increasingly evident as machining speed is increased. Test consisted of measuring amount of metal removed in producing a uniform wear land on the tool.

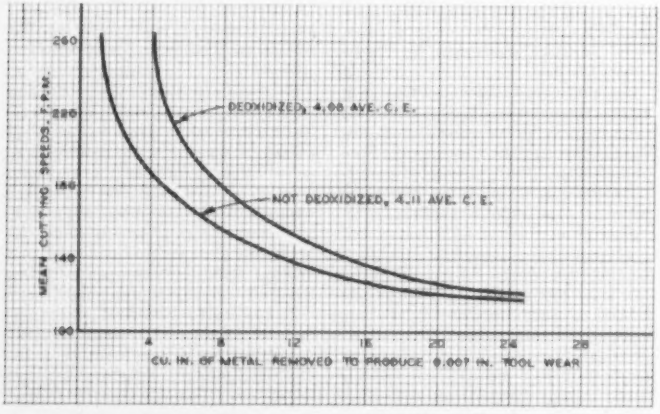


Fig. 12 . . . Similar tool life tests made by Battelle Memorial Institute, Columbus, Ohio, substantiate results obtained by Cincinnati Milling Machine Co. As before, faster machining speeds increase the superiority of deoxidized irons.

Properties not hurt

It should be mentioned also that the improvement in machinability which results from deoxidation is accomplished without detriment to the physical properties or other characteristics of the castings. In these machining tests the deoxidized irons were equal or superior to the non-deoxidized base irons in strength and elasticity.

More recent tests made by Battelle Memorial Institute, Columbus, Ohio, on a large number of rings produced by a second large automotive foundry have served to confirm Cincinnati Milling Machine Co.'s test results, as shown in Fig. 12. Here again it is readily apparent that the superior machining properties of cu-

pola deoxidized cast irons become increasingly marked as the machining speed is increased, a fact which should be of particular interest to those companies which are striving to increase machining production with existing facilities.

These latter confirming results were obtained by employing the tool wear test previously described. Further machining tests made at Battelle using a constant-pressure lathe test, originated by them, have also indicated that a significant improvement in machinability of iron castings results from the cupola deoxidization process. This test is designed to measure the metal removal rate obtained at a constant feed load, or lateral tool pressure.

Its principle is based on the assumption that an iron with superior machinability will cut with a heavier feed than one of poorer machinability when a fixed pressure is used to produce tool travel. The equipment used in this test consisted basically of a lathe with tool carriage disconnected from the fixed feed mechanism and mounted on ball-bearing apparatus for applying predetermined lateral tool pressure, and a device for recording the number of spindle revolutions occurring during a given distance of tool travel.

High phosphorus irons

The demonstrated relationship between cupola deoxidization and elimination of segregation in gray iron makes it readily apparent that the cupola deoxidization process should be particularly beneficial in improving the machinability of high phosphorus irons.

Recent machining tests made on samples of high phosphorus gray iron obtained from a southern manufacturer of pipe fittings have substantiated this belief. Four different types of machining tests were performed on two sets of samples—one set consisting of undeoxidized iron, while the other set was from the same base iron deoxidized with cupola briquettes. Both sets were of the same average chemistry, with total carbons of 3.41-3.50 per cent, silicon 1.80-1.90 per cent, manganese 0.40-0.46 per cent, sulphur 0.078-0.093 per cent, and phosphorus 0.48-0.53 per cent.

The machining tests performed on these samples consisted of: 1) tool life, 2) drill test, 3) constant pressure lathe, and 4) tap test. The tool life and constant pressure lathe tests were made as described above. The drill penetration test was performed by a southern research institute on rectangular blocks approximately ¾ x ⅞ in. cross section and 4 in. long. In this test the bars were drilled at constant feed pressure with a ⅜-in. drill and the penetration in millimeters per minute measured. Drilling was done on the drag surface, 3 to 4 test holes being drilled in each bar and the results averaged.

Six specimens of cupola deoxidized and six of undeoxidized iron, each from separate ladles, were tested and the overall averages showed that the deoxidized iron allowed 53.75 mm of drill penetration per minute compared to 50.54 mm for the undeoxidized iron. This represents a 6.3 per cent improvement in machinability as a result of the cupola deoxidization treatment.

The tap test is one developed by the southern foundry as a practical method of evaluating machinability under actual tapping conditions encountered in the manufacture of pipe fittings. A ⅜-in. lock nut is used as the test specimen because of its simplicity of design and adaptability to use of simple testing equipment. This equipment consists of a stand-

TABLE 2 — CUTTING SPEED VS. METAL REMOVED TO PRODUCE TOOL WEAR

Sample Description	Cutting Speed, msfpm	Cubic Inches of Metal Removed to Produce 0.010 in. Tool Wear	Per Cent Increase in Machinability by Deoxidization	Cubic Inches of Metal Removed to Produce 0.015 in. Tool Wear	Per Cent Increase in Machinability by Deoxidization
Deoxidized	512	6.28	100.0	13.4	71.8
Undeoxidized	512	3.14		7.8	
Deoxidized	315	15.70	177.8	28.0	174.5
Undeoxidized	315	5.65		10.2	
Deoxidized	185	47.7	51.9	63.3	37.3
Undeoxidized	185	31.4		46.1	

Table 2 . . . Machining test results showing relationship of cutting speed to volume of metal removed to produce 0.010 and 0.015 in. tool-flank wear on cupola deoxidized and non-deoxidized high phosphorus gray iron.

TABLE 3 — COMPARATIVE MACHINABILITY AS MEASURED BY THREE TESTS

Sample Description	Drill Test Penetration, mm	Constant Pressure Lathe Index	Tap Test Power Consumption, kw
Deoxidized	53.75	153	0.649
Undeoxidized	50.54	149	0.739

Table 3 . . . Comparative machinability of cupola deoxidized and non-deoxidized high phosphorus gray iron as measured by drill test, constant pressure lathe, and tap test. Samples are from the same heats as those in Table 2.

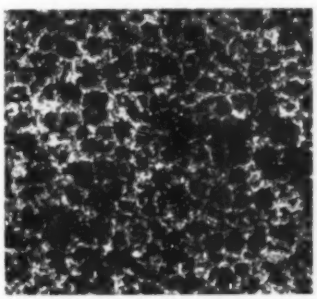


Fig. 13 . . . Photo of a fracture shows the badly segregated structure of pig iron that has not been deoxidized.

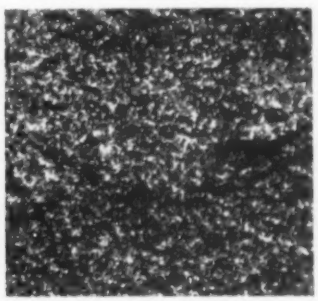


Fig. 14 . . . After deoxidization, the same pig iron as in Fig. 13 shows no segregation at its fracture.

ard drill press, indicating wattmeter, specimen holding fixture, and standard lock nut tap with integral lead section.

During all tests the specimen and tap are flooded with a standard emulsion cutting lubricant. A new tap is used in drilling samples from each ladle of iron. The cored hole of each specimen is sized to remove any small irregularities caused by metal penetration into the sand core. Great care is exercised in this operation to prevent the removal of the metal surface "skin" of the casting. Each specimen is thus given uniform treatment in its preparation without destroying conditions encountered in production operations.

In this test, degree of machinability is considered to be inversely proportional to the resistance offered by the sample to metal removal. This resistance is measured as the energy required to rotate the tap at a given rate of rotation. The energy in kilowatts required at peak load is recorded at a top speed of 41 sfpm. Twelve specimens from each of six ladles of cupola deoxidized iron and a similar number from six ladles of undeoxidized iron were tested.

Average power consumption for the deoxidized samples was 0.649 kw compared to 0.739 kw for the undeoxidized samples. This represents an improvement in machinability of 12.5 per cent resulting from the cupola deoxidization treatment. The general reliability of these tests is indicated by the fact that all four consistently show the improvement in machinability obtainable by cupola deoxidization, as shown in Tables 2 and 3.

These machining test results clearly indicate the potential cost saving available to high production industries through increased production and lower unit machining costs. Furthermore, operating experience has demonstrated that the cupola deoxidation process can be utilized in the foundry with little or no change in metal cost, so that all savings achieved in the machine shop represent clear profit to the manufacturer.

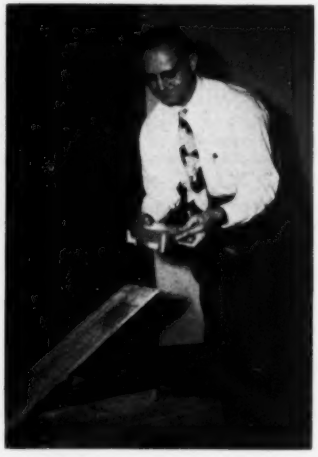
Pig iron needs deoxidization

Structural improvements are obtainable not only when deoxidizing irons made from inferior charge materials, such as rusty steel, unsegregated scrap, or stoveplate. Experimental work has shown that even charges containing only pig iron and highly selected scrap are subject to excessive segregation if not properly deoxidized during melting. In fact, recent tests made on 100 per cent pig iron have revealed that a substantial reduction in segregation may be achieved by deoxidation, even though no scrap is used in the cupola charge.

This is well illustrated in Fig. 13 and 14, which show pig iron structures before and after deoxidization with metallurgical silicon carbide. It is also quite obvious that the uniform pig iron structure produced by the cupola deoxidization process has a much higher degree of machinability than the segregated structure produced when the iron was not deoxidized with the briquettes.

▶ 1953 A.F.S. Apprentice Contest opens

This year marks the 30th anniversary of the A.F.S. Apprentice Contest. The contest which opened October 1 provides for competition in five divisions—Metal pattern making, wood patternmaking, and gray-iron, non-ferrous and steel molding. Apprentices from foundries and pattern shops throughout the United States, Canada and Mexico will be competing for honors and prizes.



Jos. E. Foster, A.F.S. technical assistant, opens crate of metal patterns to be used in 1953 Apprentice Contest.

Patterns for the molding division and drawings for the wood patternmaking division are supplied through A.F.S. headquarters. For metal pattern making, drawings and rough aluminum castings will be furnished by the national office. Master pattern and the metal for these castings was furnished by F. W. Burgdorfer, President of Missouri Pattern Works, Inc., St. Louis. Castings were made by the Ace Pattern works of the same city.

Prizes of $100, $50, and $25 will be awarded in each of the five contest divisions. In addition, first-prize winners will receive round trip pullman fare from their homes to Chicago, so that they can attend the 1953 A.F.S. Convention to be held in that city May 4-8, 1953.

The contest is open to all apprentices taking regular training courses of not less than three years duration and who are not over 24 years of age on the day they prepare their entries. For veterans, the age limit is 24 years plus the length of their service in the armed forces.

Information on the A.F.S. 1953 Apprentice Contest may be obtained from Joseph E. Foster, A.F.S. Headquarters, 616 South Michigan Avenue, Chicago 5, Illinois.

▶ Gray Iron Research Institute expands scope of operations

The Gray Iron Research Institute has moved to larger quarters at 870 W. Third, Columbus, Ohio. New facilities will include laboratory space to carry out a more intensive program of plant research and development to secure information not readily obtainable in a plant. Former arrangements with a well-known research laboratory have been terminated. To carry out the expanded program, additions to the present staff are planned. First of such additions is Karl G. Presser as assistant director. He was formerly foundry superintendent of Superior Engine Div., National Supply Co., Springfield, Ohio.

At the annual meeting of the trustees of the institute in June, the following officers for the coming year were elected: *president*, E. C. Hoenicke, Eaton Manufacturing Co., Detroit; *vice-president*, W. L. Seelbach, Superior Foundry, Inc., Cleveland; *secretary*, S. C. Clow, James B. Clow & Sons. Birmingham, Ala.; *treasurer*, J. L. Brooks, Muskegon Piston Ring Co., Muskegon, Mich. W. A. Kramer, Advance Foundry Co., Dayton, Ohio, was elected to the executive committee. T. W. Curry of Lynchburg Foundry Co., Lynchburg, Va., was appointed chairman of the Research Committee.

Practical ways of reducing the high cost of low air pressure

■ One of the greatest "hidden costs" of production should be charged to the loss of pressure in compressed-air delivery systems—that's the conclusion reached in studies made by the Compressed Air and Gas Institute, Cleveland.

Maximum benefits from the use of compressed air as a power media in production can be obtained only by those who keep a close check against leaks in air delivery systems. Where such vigilance is not maintained, the Institute points out, growing production costs are bound to appear.

It has been found, for instance, that if the pressure at a pneumatic tool falls from 90 psig to 70 psig, production output of that tool may drop as much as 35 per cent.

Or take the air motors which are used extensively to power air tools and devices. They offer more horsepower per unit weight than any other comparable sources of power. Since compressed-air systems in most plants utilize pressures between 90 and 110 psig, these motors are designed to operate most efficiently within that pressure range. An air motor, built to operate at 90 psig will lose 25 per cent of its capacity if air losses in delivering lines drop the pressure to 70 psig.

Check before you buy

One's first inclination when air pressures drop may be to blame it on insufficient compressor capacity. Quite often, however, an inspection of the air distribution system will prove that it is unnecessary to invest in new compressor equipment. Usually such inspections prove that the low-air pressure is caused by leaks in the distribution system.

Checking for leaks in air-distribution systems is a simple matter. Most likely location of small leaks will be found around valve stems, hose connections, unions, drains, home-made blow guns, and lines leading to inoperative tools. Of course, the entire system should be checked. In addition to the points just named, particular attention should be given to lines that are subjected to unusually rough treatment. Inspections should be made monthly.

Needle-gauge permits quick check of air pressure at tool for comparison with rated output of compressor. Hole made in air hose by needle is self closing.

Plant maintenance departments have come up with many simple and some rather unique ways of discovering such leaks. Passing a lighted candle or brushing a solution of soapy water around suspected areas are the most common methods of detection. One manufacturer puts essence of peppermint into the air system; detection of the slightest mint odor indicates a leak.

COST OF AIR LINE LEAKS

Size of Opening (Inches)	Air Lost (cu ft per month at 100 psig based on nozzle coefficient of 0.65)	Cost of Air Lost ($0.07 per 1000 cu ft)
1/8	6,671,890	$467.03
1/4	2,920,840	204.46
1/8	740,210	51.81
1/16	182,272	12.75
1/32	45,508	3.19

Another ingenious method is the use of a youngster's toy—a small siren-like whistle. When passed over leaky lines it gives with a siren noise that equals the decibel output of any lusty youngster. Then, of course, there are more precise methods of checking represented by devices like the needle gauge shown in the accompanying photo.

Pennies make dollars

Whatever method of inspection is used, the important thing is to find leaks and patch them. Some may be so small that regular inspections seem penny-foolish. But regular inspection of such leaks can add up into an operation that is dollar-wise.

Regular inspections of air distribution systems are justified on the basis that pennies wasted on minor leaks quickly add up into plenty of dollars in production cost. Such inspections, if carefully conducted, will show a substantial dollar savings—plus increased productive output of pneumatic tools. The table above should make clear the value of maintaining an "air-tight" operation.

Program details of five autumn regional foundry conferences

■ Five regional foundry conferences the latter part of October and in November round out the fall technical programs of a number of A.F.S. chapters and other foundry organizations.

Northwest Regional

The 3rd Annual Northwest Regional Foundry Conference, sponsored by the Washington, Oregon, and British Columbia Chapters, and the Oregon State College Student Chapter, will have the Oregon Chapter and OSC student group as hosts. All sessions will be held in the Multnomah Hotel, Portland. In addition to technical meetings and demonstrations, there will be a dance following the banquet, and a special ladies' program.

Chairman of the Northwest Regional is W. R. Pindell, Northwest Foundry & Furnace Co., Portland. Reservations for housing (Multnomah Hotel) and for all conference activities should be made with: George C. Vann, 2345 S. E. Gladstone St., Portland 2, Oregon.

Opening with an evening technical session, the Northwest Regional program is as follows:

FRIDAY, OCTOBER 24

1:00 p.m. . . REGISTRATION OPENS. Multnomah Hotel lobby.
Exhibit of non-destructive testing equipment will be on display throughout afternoon and evening.
7:30 p.m. . . *"Non-Destructive Testing,"* S. H. Graf, Director, Engineering Experiment Station, Oregon State College.

SATURDAY, OCTOBER 25

9:00 a.m. . . *"Modern Core and Molding Sands,"* Charles B. Schureman, consultant.
12:00 noon . . LUNCHEON. Address by Dean George W. Gleason, School of Engineering, Oregon State College.
2:00 p.m. . . *"Use of Mineral Perlite in the Foundry,"* Edward D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash.
3:30 p.m. . . *"Olivine in the Northwest Foundry,"* W. A. Snyder, University of Washington.
7:00 p.m. . . BANQUET. Address by Richard L. Neuberger, author, lecturer, and civic leader.
Dance. Van Armitage and orchestra.

For the ladies, a special program starts with a lunch at 11:00 a.m., Saturday, October 25. Following will be a talk on *"American Heritage"* by Mrs. Rozaline Walton, Heitkemper Jewelers.

New England Regional

The 12th New England Regional Foundry Conference, being held Friday and Saturday, October 24 and 25, was planned under the chairmanship of Robert C. Walker, Whitin Machine Works, Whitinsville, Mass. The technical meetings and the conference dinner, will be at Massachusetts Institute of Technology. Traditional dinner and smoker concluding the two-day meeting will again be at the Parker House, Boston.

FRIDAY, OCTOBER 24

9:00 a.m. . . REGISTRATION.
9:30 a.m. . . CONFERENCE OPENING.
Robert C. Walker, Whitin Machine Works, Whitinsville, Mass.
10:00 a.m. . . GROUP MEETINGS.
Ferrous . . *"Melting Ductile Iron in a Basic Cupola,"* C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.
Non-Ferrous . . *"Shell Molding as Applied to the Non-Ferrous Industry,"* Bernard N. Ames, New York Naval Shipyard, Brooklyn, N. Y.
12:00 noon . . LUNCH. Walker Memorial.
1:30 p.m. . . *"Shell Molding,"* William F. Rose, Borden Co., New York.
3:00 p.m. . . *"These Mortals,"* F. Alexander Magoun.
6:00 p.m. . . CONFERENCE DINNER. Speaker to be announced.

SATURDAY, OCTOBER 25

8:00 a.m. . . REGISTRATION.
9:00 a.m. . . *"Foundry Core Practice,"* Harry W. Dietert, Harry W. Dietert Co., Detroit.
10:30 a.m. . . GROUP MEETINGS.
Ferrous . . *"Cupola Operation,"* Donald J. Reese, International Nickel Co., New York.
Non-Ferrous . . *"Effect of Gating on Casting Quality,"* A.F.S. research film.
12:00 noon . . LUNCH. Walker Memorial.
2:00 p.m. . . *"How Can Best Casting Results be Obtained with Naturally Bonded Sand,"* Clyde A. Sanders, American Colloid Co., Chicago.

Metals Casting Conference

Shell molding, quality control, materials handling, a student demonstration of cupola operation, and the banquet address *"Building for Tomorrow"* are among features of the 5th Annual Metals Casting Conference. Scheduled for Thursday and Friday, October 30-31, at Purdue University, West Lafayette, Ind., the conference has as chairman, Lewis D. Reiff, Superior Malleable & Steel Castings Co., Benton Harbor, Mich.

Advance registration can be made through the Comptrollers Office, Purdue; fee for the entire conference including the banquet is $6.00, for the second day only, $2.50. Overnight reservations can be made at the Purdue Union Club, West Lafayette, or the Fowler Hotel or Bryant Hotel, Lafayette.

THURSDAY, OCTOBER 30

9:00 a.m. . . REGISTRATION. Room 350.
10:00 a.m. . . CONFERENCE OPENING
"A Conference for the Casting Industry," Dean A. A. Potter, Purdue, and A.F.S. President I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind.
"Buyer's Viewpoint," Joseph P. Stanton, Ford Motor Co., Detroit.
1:30 p.m. . . *"Present and Future of the Casting Industry,"* Frank G. Steinebach, *Foundry*, Cleveland.
3:00 p.m. . . *"Foreman's Part in Better Castings,"* Robert Franck, Superior Malleable & Steel Castings Co., Benton Harbor, Mich., and E. Crowell Knight, Ross Gear & Tool Co., Lafayette, Ind.
6:30 p.m. . . BANQUET. *"Building for Tomorrow,"* Alfred P. Haake, General Motors Corp. Entertainment. Piano-Duo, J. F. Lindley and R. W. Lindley.

FRIDAY, OCTOBER 31

10:00 a.m. . . *"What Quality Control Means to Engineering and to Buyers of Castings,"* O. K. Hunsaker and Edward Price, Dayton Malleable Iron Co., Ironton, Ohio.

11:15 a.m. . . *"Shell Molding,"* W. S. Walters, LaGrange Shell Molders, Inc., LaGrange, Ind.

1:30 p.m. . . *"Material Handling in the Foundry,"* K. F. Lange, Link-Belt Co., Chicago.

3:00 p.m. . . OPERATION OF BABY CUPOLA. Demonstration by Foundry Educational Foundation students.

All-Canadian Conference

The 4th All-Canadian Foundry Conference will be held at the Mount Royal Hotel, Montreal, Que., with technical meetings and plant visits November 6 and 7 and technical meetings and a football game November 8, according to Conference Chairman A. E. Cartwright, Crane Ltd., Montreal. Technical sessions will be held at both the Mount Royal and at the Montreal Technical School. A dinner and special entertainment are scheduled for the evening of November 7. Following registration the morning of Thursday, November 6, the conference will open with a luncheon. Thursday afternoon and Friday morning are reserved for plant visits.

The three-day All-Canadian Conference program includes:

THURSDAY, NOVEMBER 6

Forenoon . . REGISTRATION. Mount Royal Hotel.

Noon . . LUNCHEON. Mount Royal Hotel.

Afternoon . . PLANT VISITS. Leave from Mount Royal Hotel.
Crane Ltd., Montreal.
Dominion Engineering Works, Ltd., Montreal.
Robert Mitchell Co. Ltd., Montreal.

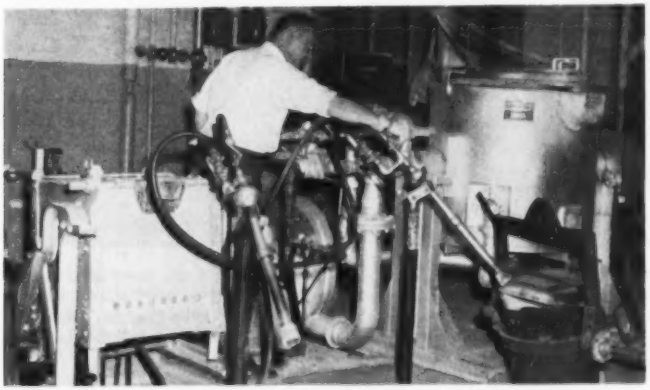
Evening . . *"Effect of Gating Design on Casting Quality,"* S. C. Massari, A.F.S. Technical Director.

FRIDAY, NOVEMBER 7

Forenoon . . PLANT VISITS. Leave from Mount Royal Hotel.
Canadian Car & Foundry Co., Ltd., Longue Pointe.
Montreal Bronze, Ltd., Montreal.
Warden King, Ltd., Montreal.

Afternoon . . GROUP MEETINGS. Mount Royal Hotel.

Gray Iron . . *"Cupola Practice—I,"* Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago.



Visitors to the Purdue University foundry during the Metals Casting Conference may catch Prof. C. T. Marek, in charge of foundry practice, at work like this adjusting ladle preheaters prior to tapping. Swivel-mounted burners swing in wide arc to heat any ladles, large or small, placed nearby.

Non-Ferrous . . *"Brass & Bronze,"* M. J. Davidson, Canada Metal Co.
"The Comparative Foundry Characteristics of Magnesium and Aluminum," M. N. Martinson, Light Alloys Foundry.

Steel . . *"Acid Electric Melting,"* John Juppenlatz, Lebanon Steel Foundry, Lebanon, Pa.

Evening . . BANQUET AND FLOOR SHOW. Mount Royal Hotel.

SATURDAY, NOVEMBER 8

Forenoon . . GROUP MEETINGS. Montreal Technical School.

Gray Iron . . *"Cupola Practice—II,"* Thomas E. Barlow.

Non-Ferrous . . *"Rapid Tests in Metal Quality During Melting Operations,"* H. H. Fairfield, Wm. Kennedy & Sons, Owen Sound, Ont.
"Gates and Risers for Permanent Mold Castings in Aluminum," Jack Ramsden, Ramsden Manufacturing Ltd., London, Ont.

Steel . . *"Molding Methods,"* John Juppenlatz.

Southeastern Regional

The Southeastern Regional Foundry Conference includes two full days of technical meetings, two luncheons, a Texas barbecue, and a banquet. To be held at the Hotel Baker, Dallas, Texas, November 13-14, the conference is under the general chairmanship of James R. Hewitt, Houston, for the third year.

A full two-day ladies program is planned as in previous years. Hotel reservations for the conference can be made through W. A. Bittel, Royall Firebrick & Supply Co., 3200 Main St., Dallas, Texas.

The conference program is:

THURSDAY, NOVEMBER 13

8:00 a.m. . . REGISTRATION.

10:00 a.m. . . *"Sand,"* Earl E. Woodliff, consultant, Detroit, and Henry W. Meyer, General Steel Castings Co., Granite City, Ill.

12:30 p.m. . . LUNCHEON. Speaker, A.F.S. Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion Mich.

2:00 p.m. . . *"Pneumatic Reclamation of Foundry Sands,"* Clifford E. Wenninger, National Engineering Co., Chicago.

3:30 p.m. . . GROUP MEETINGS.

Gray Iron . . *"Gating and Risering,"* Harry H. Kessler, Sorbo-Mat Process Engineers, St. Louis.

Steel . . *"Steel Castings,"* John B. Caine, consultant, Cincinnati.

Non-Ferrous . . *"Gating of Brass and Bronze Castings,"* Walter W. Edens, Federated Metals Div., American Smelting & Refining Co.

6:30 p.m. . . TEXAS BARBECUE.

FRIDAY, NOVEMBER 14

9:30 a.m. . . *"Standard Costs,"* William Busby, Texas Foundries, Lufkin, Texas.
"Human Engineering," William M. Ball, Jr., R. Lavin & Sons, Cincinnati.

12:00 noon . . LUNCHEON. *"Safety and Accident Prevention,"* F. H. Kobely, Columbia-Geneva Steel Div., United States Steel Co., San Francisco. Also film on dust control.

3:30 p.m. . . GROUP MEETINGS.

Gray Iron . . *"Use of Ferroalloys in Gray Iron Foundries,"* Herman J. Pfeifer, Jr., Electro Metallurgical Div., Union Carbide & Carbon Corp., Houston, Texas.

Steel . . *"Steel Molding Machines and Allied Equipment,"* speaker to be announced.

Non-Ferrous . . *"Aluminum Casting Defects,"* Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

7:00 p.m. . . BANQUET. Speaker to be announced.

Ohio chapters hold fifth annual regional foundry conference

■ Ohio foundrymen gathered September 26 and 27 at Ohio State University, Columbus, for their 5th annual regional conference. The conference opened with a welcome from William T. Bland, Commercial Steel Castings Co., Marion, immediate past chairman of the Central Ohio Chapter which was host to the conference this year. He was introduced by D. C. Williams, Industrial Engineering Dept., Ohio State University, general chairman of the conference.

Kenyon S. Campbell, Ohio State, welcomed the conference to the University and paid tribute to foundrymen of the area for their counsel and material assistance in developing the school's foundry laboratory and securing equipment.

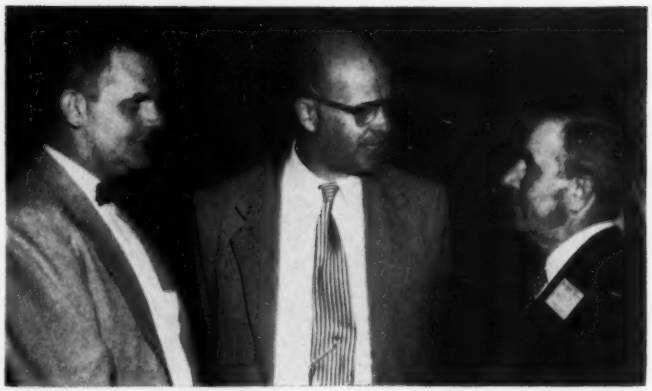
First technical speaker was Charles T. Estes whose subject was *"The Boss and You—How do You Get Together?"*

A supervisor is an educator and a mediator, said Major Estes, stating that management must provide the tools which will enable the supervisor to carry out these jobs. He reviewed the concept of promoting a man to foreman because he's the best mechanic rather than because he is a good transmitter of ideas and information, and recommended against it.

Recommends Salesmanship

Foremen are receivers, digesters, and finally transmitters of ideas, according to the speaker. He warned that a man may receive ideas but in acting on them he may become a distorter, a transformer, or an insulator. In communicating any idea, he said, it is important to prepare the receiver for the idea before giving it to him. There is danger, he declared, in resorting to authority instead of discussion and selling in getting people to do what we want them to do.

Luncheon speaker was Richard Anderson, Battelle Memorial Institute, Columbus. He talked on Alaska as a 49th state. Eldon Boner, Cooper-Bessemer Corp., Mt. Vernon, was luncheon chairman.



Discussing conference operations with A.F.S. President I. R. Wagner (right), Electric Steel Castings Co., Indianapolis, are Ray Meyer (left), Ohio Steel Foundry, Springfield, conference treasurer, and E. M. Durstine, Keener Sand & Clay Co., Columbus, chairman of the Central Ohio Chapter, one of the sponsoring groups.

At the general sessions following lunch, the first speaker was G. J. Grott, Unitcast Corp., Toledo; his subject, *"Metal Removal."* David C. Ekey, Industrial Engineering Dept., Pennsylvania State College, was chairman. Second speaker was Clarence E. Sims, Battelle Memorial Institute, who spoke on *"Gases in Metal."* J. W. Spretnak, Metallurgy Dept., Ohio State University, presided over the second session.

Mr. Grott discussed the metallurgical and mechanical properties of gray iron, malleable iron, nodular iron, and constructional grades of steel and told how they influence methods of metal removal. The foundryman has learned to work within the limitations of the various properties, he said, and also exploits them. As an example of the latter he cited the frequent use of sledging for removing gates and risers from low impact materials such as gray iron and pearlitic malleable. Low resistance to oxidation and relatively low hardenability of most steels makes flame cutting predominate in this field, he said in giving another instance.

For nodular iron, resistance to oxidation, high hardenability, and sufficient impact resistance to make sledging difficult, create a special problem, he declared. Flame cutting is possible and, though the hardened layer may be as deep as 0.1 in., he said, it is practical where annealing is part of the production cycle. The remaining metal may be removed by grinding after annealing. Notching or total removal with a carbon arc and air is also possible, he stated.

Where no heat treatment is used, according to Mr. Grott, the only alternative to deep notching with chisels and cut-off wheels is to flame cut, or use the carbon arc and air, at some distance from the finish surface of the casting.

The three principal gases of concern in cast metals are oxygen, nitrogen, and hydrogen, Mr. Sims said at

the start of his talk. Hydrogen is the worst offender, he said, noting that it is the principal cause of porosity and also decreases the ductility of some metals.

If hydrogen precipitates early in freezing, Sims said, it will form blowholes; if late, microporosity. Greatest source of hydrogen, he declared, is water which reacts with the metal to form an oxide and release atomic hydrogen in contact with the metal.

Moving to the Deshler-Wallick Hotel from the campus for the evening, foundrymen attended the conference banquet to hear National President I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., and Alfred B. Garrett, Chemistry Dept., Ohio State University. Dr. Williams presided and announced the establishment of a graduate scholarship at OSU with funds provided by Fred G. Kramer, American Silica Sand Co., Ottawa, Ill. He also announced that the 1953 Ohio Regional would be held in Cincinnati.

In commenting briefly on the activities of A.F.S., Mr. Wagner cited the value of cooperative efforts of foundrymen who join in solving their common problems. Dr. Garrett discussed "*Problems in Our Atomic Age*," pointing out that though scientists can solve problems, it takes religion to make people want to solve them.

Back on the campus the following day, conference attendants split into four groups to hear speakers on gray iron, steel, non-ferrous, and malleable topics. Speakers, topics, and chairmen of the first round of group meetings were: gray iron—John A. Sharritts, John A. Sharritts & Co., Cleveland, "*My Experience as a Superintendent of a Gray Iron Foundry;*" Henry J. Trenkamp, Ohio Foundry Co., Cleveland, presided . . . steel—Pat Collins, Michigan Steel Castings Co., Detroit, "*A Modern Method of Determining and Utilizing Grinding Wheel Efficiency in Incentive Pay Systems;*" chairman was V. E. Zang, Unitcast Corp., Toledo, Ohio . . . non-ferrous—Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., Barber, N. J., "*Aluminum Alloy Test Bars—Their Meaning and Production;*" Walter J. Klayer, Aluminum Industries, Inc., Cincinnati, was chairman . . . malleable—Milton J. Tilley, National Malleable & Steel Castings Co., Cleveland, "*Effect of Oxidizing Rates during Cupola Melting on the Graphitization of Malleable Iron;*" presiding was Albert S. Johnson, Lake City Malleable Iron Co., Cleveland.

Separately-cast test bars, Mr. LaVelle said, do not test castings and are only remotely related to casting quality. Neither are their properties necessarily related to those of test bars cut from castings, he warned. They furnish a check on the quality of the metal as influenced by melting practice and a check on heat treatment. He pointed out that making test bars is an art which usually must be learned by experience which is not necessarily gained in the production of castings.

Light metals speakers and the chairman of their sessions were, left to right: A.F.S. National Director Walter J. Klayer, Aluminum Industries, Inc., Cincinnati, session chairman; Donald L. Colwell, Apex Smelting Co., Chicago; and Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

Not all of the wide varitey of test bars in common use are suited to the purpose for which they are intended, declared LaVelle. Of the two basic types—gated one end and gated both ends—the type fed from both ends appears to be more widely accepted, he said. A good test bar should give good properties with a minimum of deviations and casting difficulties but not necessarily the highest possible properties. This is the objective of the Test Bar Committee of the A.F.S. Light Metals Division, he said, which has a tentative design about ready for pattern equipment.

Studies silicon loss

Milton Tilley brought his listeners up to date on work he originally reported at the 1950 Ohio Regional. At that time he pointed out that graphitizing rate of holding furnace iron was greatly influenced by rate of oxidation in the cupola.

In his latest work, Mr. Tilley told of taking cupola iron specimens at five minute intervals, representing the composition of approximately one-twelfth of a charge due to the small well zone of the continuous tap cupola. The silicon content indicated the nature of the material being melted at a given time and to some extent the degree of oxidation, he said. Normal nodule count and graphitization could be restored by adding more than enough ferrosilicon to replace the silicon lost, indicating that silicon loss alone does not account for the abnormal graphitization. (For full story see page 46.)

The second series of group meetings—gray iron, steel, non-ferrous, and malleable—concluded the technical sessions of the conference. A. J. Dublo, Sterling Foundry Co., Wellington, Ohio, spoke on cupola operation at the gray iron session; Mr. Trenkamp again presided.

Mr. Dublo described in detail the production of iron for machine tools, using 78-in. cupolas lined down to 54 in. ID with two courses of firebrick. An air placement gun is used for patching, reducing the time required to one-half or less than was formerly required. He prefers a straight lining with a slight bosh over the tuyeres, said the speaker. Bottom doors, which used to be laboriously raised with a winch are now hoisted by the charging crane. Regular green molding sand is used for the cupola bottom. The slag hole, replaced every three or four heats,

is a commercial silicon carbide block with a 1¼ in. hole.

About two-thirds of the bed coke is ignited by gas burners in containers outside the cupola, according to Mr. Dublo. By the time the cupola is ready for the coke, the by now white-hot fuel is dumped into the furnace. A small amount of cold coke on the bottom protects the sand from the impact. Light-up done this way, said Dublo, saves time and eliminates the smoke and fumes which result when wood is used.

Chill tests, metal temperatures, observation of slag and metal, and appearance of smoke from the cupola are all used in controlling cupola operation. When the smoke is blue or blue-gray the iron is at its best, explained Dublo, but when it is dark brown or reddish-brown, the iron is cold, and chills and carbons are erratic. Solution, he said, is to reduce the blast and add an extra split of coke.

Comparing notes on gases in metals following Mr. Sims' talk on the subject are, left to right: W. S. Pellini, Naval Research Laboratory, Washington, D. C.; Milton Tilley, Nat'l Malleable & Steel Castings Co., Cleveland; Prof. J. W. Spretnak, Ohio State University; and Clarence E. Sims, Battelle Memorial Institute, Columbus.

W. S. Pellini, Naval Research Laboratory, Washington, D. C., spoke on *"Metallurgy and Mechanics of Hot Tearing"* at the steel meeting. Mr. Zang presided. Hot tearing, said the speaker, represents non-ductile behavior during solidification when continuous liquid films are present. This has been demonstrated conclusively by simultaneous radiographic determination of the time hot tears are developed and thermal analysis of the solidification conditions. In all cases, he stated, hot tearing is developed when the metal approaches the solidus temperature, at which time the metal consists of solid dendrite masses separated by films of interdendritic liquid.

Hot tearing is potentially possible in all metals having a distinct solidification range, according to Mr. Pellini. Whether or not it actually occurs depends on the mechanical conditions of the casting system—conditions which determine the development of a strain in hot spot regions potentially capable of hot tearing. Attention to mold details and casting design to eliminate hot spots is of primary importance, he said. Metal aspects of hot tearing have been over-emphasized, Pellini said in conclusion, with the result that insufficient attention has been given to controlling mold conditions.

Second non-ferrous speaker was Donald L. Colwell, Apex Smelting Co., Chicago; Mr. Klayer presided. Mr. Colwell discussed the ternary alloys of aluminum-zinc-magnesium which develop high strengths without heat treatment. Rate-of-aging curves shown by the speaker brought out the gradual aging, reaching completion in several months, and the fact that their permanent properties are superior to those of the usual aluminum castings heat treated.

In addition to superior mechanical properties, Mr. Colwell cited the excellent machinability, dimensional stability, and brazing characteristics of the Al-Zn-Mg alloys.

James S. Lansing, Malleable Founders' Society, Cleveland, discussed malleable iron practice with special reference to gating and feeding at the second malleable session. Charles F. Bunting, Rockwell Mfg. Co., Barberton, Ohio, was chairman. Mr. Lansing showed typical malleable gating systems and described testing of the effectiveness of gates and risers by breaking hard iron castings. Breakage alone is not adequate, however, he said, if the castings are required to meet pressure specifications. He showed examples of simplification in feeding achieved through modification of casting design.

The 5th Ohio Regional Foundry Conference concluded with a luncheon addressed by Brig. Gen. William Hefley, Wright-Patterson Air Force Base, Dayton, Ohio. The foundry industry is basic to the air force, directly through aircraft castings and indirectly through castings used in machine tools and other equipment, he said. He cited the flexibility of the foundry industry, its decentralization, and the readiness with which castings replace non-cast parts to show how important foundries are to air power. Clyde E. McQuiston, Industrial Engineering Dept., Ohio State University, was luncheon chairman.

General Conference Chairman Williams closed the conference with thanks to committee members and others who had contributed their time and talent to the meetings. Working with Dr. Williams as associate chairman of the conference were: Charles T. Greenidge, Battelle Memorial Institute, Mr. Boner, and Mr. McQuiston. Program Committee members were: Messrs. Zang, Klayer, Trenkamp, and Greenidge, and Alexander Prentice, Stark Foundry Co., Canton, Ohio.

Pictures were provided by Wilfred H. White, Jackson Iron & Steel Co., Jackson, Ohio. Publicity was under J. G. Lummis, A. P. Green Firebrick Co., Elmer Doerr, Frederic B. Stevens Co., and William F. Rounds, Jr., Ohio State University, all of Columbus. Handling finances and registration were: Ray Meyer, Ohio Steel Foundry, Springfield; Thomas S. Cusack, Oliver Corp., Springfield; and Frank Schneider, Jeffrey Mfg. Co., Columbus.

WANTED

Foundry Engineer

Experienced foundry engineer for steel foundry in large industrial city in Brazil. Interesting work — modernizing and mechanizing existing foundry. Knowledge of Portuguese or Scandinavian language advantageous but not essential. Age about 35. Interviewing executive in United States until end October. Immediate reply requested. Write HW613, American Foundryman, 616 South Michigan Ave., Chicago 5, Ill.

NICKEL ALLOY IRONS
develop improved properties
plus all the basic advantages of plain cast iron

PLAIN GRAY IRON is, structurally, a steel matrix containing graphite flakes. Engineering, physical, processing and service properties are wholly dependent upon the character and disposition of these flakes, and upon the nature of the matrix.

The matrix of nickel alloyed irons closely resembles the pearlitic matrix found in high carbon steels, whereas the matrix of ordinary plain iron resembles that found in low carbon steels. Compositions of nickel alloy irons can be adjusted to reduce "chill" in thin sections without risk of forming "spongy" regions in heavy sections. This promotes uniform strength, improved machinability, pressure tightness and wear resistance.

Hardness in nickel cast irons results from improvement of the matrix. Chilled areas and hard carbides, which impair machinability, are obviated. Nickel improves response to heat treating. In fact, use of nickel alone or with other alloying elements plays an important part in meeting a variety of requirements.

Accordingly . . . nickel alloyed irons permit production of castings with high levels of the following properties:

Strength

Tensile and transverse strengths of castings are greatly increased by the addition of nickel to cast irons of properly adjusted base mixture. The ratio of compressive strength to tensile strength is retained. Greater uniformity of strength in thick and thin sections is achieved.

Elasticity

The elastic modulus increases with strength. In this respect nickel-containing irons of the high strength type possess good stiffness and do not deform permanently under loads that would be damaging to irons of lower elastic modulus.

Damping Capacity

The damping capacity inherent in gray cast iron is not impaired by the presence of nickel.

Wear Resistance

The uniformly pearlitic matrix of nickel cast irons appreciably improves wear resistance. The uniformly fine graphite flake distribution, achieved in suitably processed irons *without formation of a poor wearing dendritic condition*, affords optimum resistance to wear and galling.

Pressure Tightness

Characterized by dense grain structure and fine dispersion of graphite throughout, nickel alloy irons are close-grained and offer an extraordinary degree of pressure tightness under high hydrostatic pressures, without sacrificing machinability.

Applications

Heavy machinery frames and *beds* are typical of cast parts that benefit from the rigidity and good damping capacity of nickel cast irons. *Cylinder* and *pump liners, gears, dies, machine tool ways, saddles* and *tables* exemplify parts produced in nickel irons to assure greatly increased strength and wear resistance. And nickel alloyed iron is used for *heavy duty brake drums* to resist heat checking, thermal shock, wear and galling. The nickel cast irons are readily heat treated, and respond particularly well to flame and induction hardening.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel cast irons for many end uses in defense and defense supporting industries.

The International Nickel Company, Inc.
Dept. AF, 67 Wall St., New York 5, N. Y.

Please send me booklet entitled, "Guide to the Selection of Engineering Cast Irons."

Name _____ *Title* _____

Company _____

Address _____

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Federated's nation-wide acquaintance with the problems *you* meet in *your* foundry makes Federated Ingot the best for you to buy.

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How variations in water affect properties of bentonite

■ Study of variations in industrial waters collected from different sections of the country shows that such variations affect the performance of bentonite when used as a bonding and a suspending agent.

Results of the study are important to the many foundries where bentonite of the "western" or "swelling" type is used either as a bonding agent for molding sand or in the formulation of core and mold washes. In the latter use the bentonite functions as a suspending agent for silica flour and similar materials.

Both of these applications entail mixing the bentonite with water and other ingredients under such circumstances that the bentonite-water ratio varies greatly. The water is, of course, the industrial water conveniently available.

F. L. CUTHBERT / *Technical Director, National Lead Co. of Ohio, Cincinnati*
T. M. DYER / *Formerly Field Service Engineer, National Lead Co., Los Angeles*

Variation in waters

Industrial waters will vary from one section to another and also seasonally. The major causes of these variations are, first, the nature of the source, whether lake, river, reservoir, or underground, and second, the type of water treatment.

Samples used in the study were collected from the industrial water supplies of several cities during the same week. Water analyses were made according to standard methods. The results are shown in Table 1. It is believed the variations shown in the chemical composition of these waters are typical.

TABLE 1: ANALYSES OF INDUSTRIAL WATERS FROM VARIOUS CITIES

(Results In Parts Per Million)

	Source	Na	Ca	Mg	SiO_2	SO_4	Cl	HCO_3	pH	Total solids
Distilled Water		2	8	2	2	0	6	24	6.8	44
Pittsburgh "	River	0	20	3	11	24	17	14	6.7	94
Brooklyn "	Reservoir	7	8	7	5	0	6	65	7.0	100
Tulsa "	Lake	0	38	1	11	0	12	100	8.0	167
Chicago "	Lake	0	38	10	14	29	14	93	8.3	202
Houston "	River	85	24	4	16	3	166	30	7.0	341
St. Louis "	River	57	43	7	19	168	49	25	9.0	384
Los Angeles "	River	34	46	34	18	158	40	133	7.8	477

Sand and settling tests

The various samples of industrial waters were used as tempering water in the preparation of bentonite-sand mixes. All molding sands were prepared by mixing 80 grams of dry bentonite, 1920 grams of Del Monte sand and varying amounts of water.

Bentonite and sand were mixed dry for two minutes, water was added and the mixing continued for a total of seven minutes. The green and dry compressive strengths of the mixes were determined according to A.F.S. procedure and reported for 2 per cent tempering water in all cases. The same sample of bentonite was used in all of the tests.

In addition to the sand tests, a "settling test" was made using the same sample of bentonite in each of the different waters. In this test, a 0.2-gram portion of bentonite was sprinkled with a spatula from a height of one centimeter onto the surface of the water contained in a 50-ml beaker.

The time in seconds for the first large flocs of bentonite to fall to the bottom of the beaker was measured. This test was made with bentonite which had been dried at 105 C in an effort to avoid the effect of day to day variation in moisture content of the bentonite. The results of the settling tests and foundry tests are given along with other tabular information in Table 2, shown on the following page.

Effect of the different waters on the suspension characteristics of a bentonite was determined by measuring the viscosity and gel-strength of 6 per cent bentonite-water slurries prepared with the various waters. The slurries were prepared by mixing 22.34-gram portions of bentonite on an "as received" basis in 350 ml of the different waters.

Slurries were stirred 15 minutes in a mixer and tested for viscosity and gel-strength with a Stormer viscostimeter.

What gel-strength means

Viscosity and gel-strength characteristics are a measure of the ability of a bentonite slurry to support materials, such as silica flour. Gel-strength, as reported in Table 2, is the weight in grams required to start rotation of the spindle of the Stormer viscosimeter immediately after agitation of the bentonite-water slurry

TABLE 2: CORRELATION OF WATER ANALYSES WITH FOUNDRY & SUSPENSION PROPERTIES

	Water Analyses	Foundry Properties			Suspension Properties		
	Total Solids ppm	Compression Green, psi*	Strength Dry, psi*	Settling Time Seconds	Viscosity cp	Gel-Strength, Grams Initial	10 Minute
Distilled Water	44	5.85	60.0	25	14.0	6	38
Pittsburgh "	94	5.85	58.0	25	13.2	13	38
Brooklyn "	100	5.90	59.0	21	14.0	12	48
Tulsa "	167	5.80	58.0	18	12.5	8	34
Chicago "	202	5.78	60.0	16	13.2	12	48
Houston "	341	5.80	59.0	15	12.1	13	43
St. Louis "	384	5.90	59.0	11	12.1	15	40
Los Angeles "	477	5.90	60.0	11	11.4	10	33

*2 per cent moisture

and after the slurry has stood ten minutes. These suspension characteristics also are shown in Table 2.

Analyses of the several industrial waters showed considerable variations in the dissolved salts, total solids and pH. These variations, however, had no apparent effect on the bonding properties of a bentonite-bonded-molding sand tempered with these waters. As shown in Table 2, there is no appreciable variation in green and dry compression strengths for any of the waters.

Some variation was found in the settling time of the dry bentonite. This test was originally proposed as a quick method to determine the bonding efficiency of bentonite, the bentonite taking the longest time to settle being the most desirable. Table 2 shows that the same bentonite settled at different rates in the different industrial waters although there was no difference in compressive strengths.

Settling time apparently is influenced by the soluble solid content of the waters. The higher the total dissolved solids, the shorter the settling times. Other tests, unreported here, have shown that the settling test is extremely sensitive to such things as the moisture content and particle size of the bentonite and cleanliness of the container.

A trend was noticed between the total solids content of the waters and the viscosity of bentonite slurries prepared with these waters. In general the higher the solids content the lower the viscosity.

No correlation was apparent, however, between the total solids content of the waters and the gel-strength of bentonite slurries.

Considerable variation was found in the composition of industrial waters in different sections of the country. This variation had no apparent effect on the bonding properties of bentonite-bonded molding sands tempered with these waters. The suspension characteristics of bentonite slurries were, however, affected by the composition of the industrial waters used in preparing the slurries. Bentonite-slurries prepared with waters having a high dissolved-solids content were in general lower in viscosity than slurries prepared with relatively pure water. Thus the suspension properties of core and mold washes containing bentonite might be expected to vary with changes in water supply.

▶ *Cast plaque for new headquarters*

National President I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind. (left), and Secretary-Treasurer Wm. W. Maloney examining cast bronze A.F.S. plaque produced by the University of Alabama Student Chapter for the new A.F.S. headquarters. Students made pattern as well as casting.

THIS KIRK AND BLUM DUST CONTROL SYSTEM ON SPRUE-BREAKING AND CORE KNOCK-OUT OPERATIONS

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The photograph below shows the molding line, hoppers and supports which were also fabricated and installed by the Liberty Engineering Division. Other KIRK & BLUM systems are found in this same well known manufacturer's plant.

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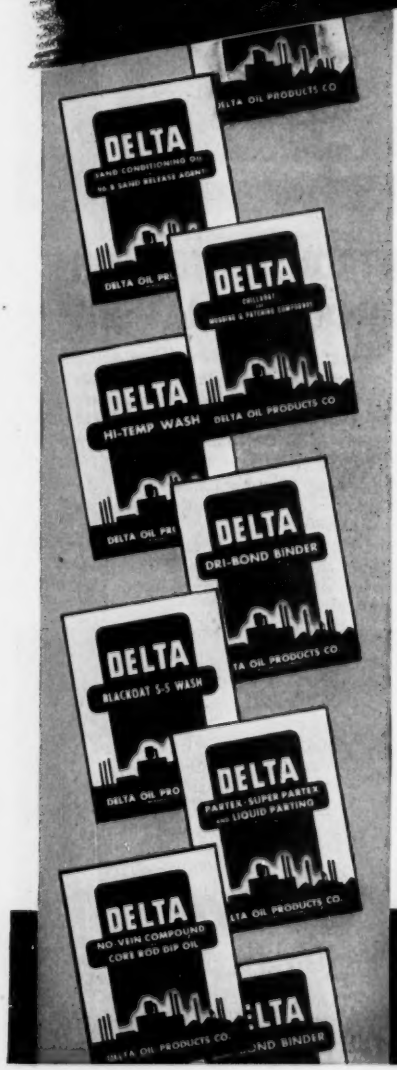

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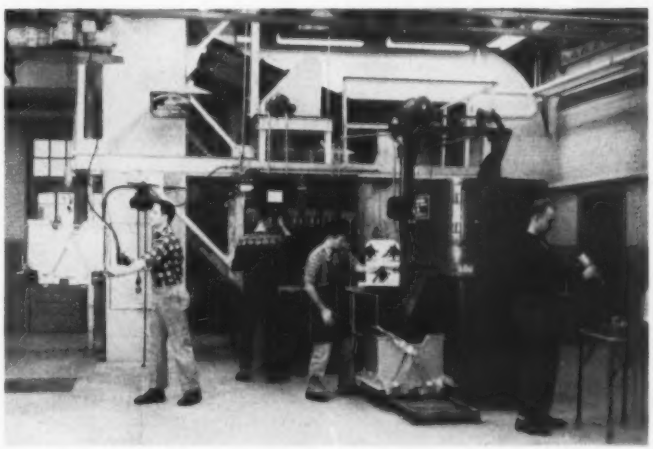
Modern Purdue University foundry

Built around sand handling system

JAMES MAYER / *News Editor, Purdue Exponent*

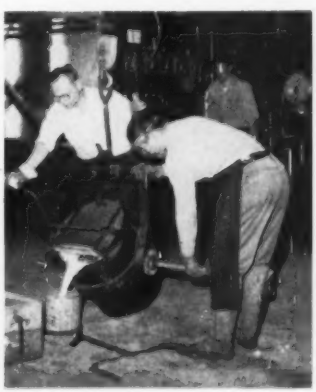
Advance of engineering school foundries since the "pounding sand in a rat hole" days is illustrated by the Purdue University foundry laboratory which will be open during the Metals Casting Conference, October 30-31. Behind the Purdue story is an untold tale of a foundry industry battle against forces which led some to believe that the castings industry was dormant and dying, that castings were obsolete, and that foundry laboratories and courses were no longer required. Jim Mayer's story shows the industry is alive and growing. Photographs were furnished by H. C. Gillespie, Purdue Bureau of Information. Floor layout was originally published by American Foundryman in June 1951.

■ Pouring of the first heat from the cupola last spring marked the completion of the $120,000 remodeling and mechanization of the Purdue University foundry. Previously confined primarily to hand operations, the foundry now has a mechanized sand-handling system, tramrails for



Backbone of Purdue University's modern engineering school foundry is the mechanical sand handling system. Used sand moves by belt traveling under floor-level shakeout grates located at four places adjacent to molding bays. Conditioned sand is delivered to molding areas in drop-bottom buckets moved via tramrail.

L. D. Weast, of the foundry staff, plugs cupola after first tap. Short roll conveyor facilitates positioning bull ladles.



Prof. C. T. Marek (left) and H. A. Montgomery fill 2-man ladle in molding bay opposite sand conditioning equipment.

Students at jolt-squeeze machine inspect mold before closing. Same sand bins service machine as well as bench molders.

Not mechanized is weight shifting which students share. Molding sand bins and benches are in background.

pouring and general materials handling, metal and sand control laboratories, modern cleaning and core departments, and a well-equipped, modern melting department.

The foundry was built primarily to familiarize engineering students with foundry operations and application of foundry principles to design. Recognizing the foundry industry's need for engineering graduates with an understanding of basic techniques of foundry production, Purdue officials authorized the complete overhaul and modernization of the schools old foundry.

Prof. C. T. Marek started planning the foundry with the assistance of the school's Industrial Advisory Committee of the Foundry Educational Foundation. Heading the committee at the time was Paul H. Harlan, Electric Steel Casting Co., Indianapolis, Ind. Present chairman is Fred Carl, Fabricast Div., General Motors Corp., Bedford, Ind.

Backbone of the 65 x 105 ft layout is the sand-handling system. Molding sand, dropped through the four shakeout grates, is carried under the floor and over a magnetic pulley by a 40-ft belt. A bucket elevator lifts the sand 15 feet above floor level, discharging it onto a vibrating deck screen. A lever-actuated baffle determines whether the sand falls into the 12-ton ferrous sand storage bin or the 6-ton non-ferrous bin. From the bins, a skip hoist fills the 400-lb capacity muller with sand.

After mulling, the sand drops into a 400-lb, drop-bottom bucket. The bucket, suspended from a tramrail, is switched from the sand-handling and furnace section of the overhead system to the molding bay section where the sand is dropped into one of the four molding station bins. There are four molding benches and four 4-cu ft bins to each molding bay. The bins serve four jolt-squeeze machines as well as six other production molding machines which include a jolt-rollover-pattern draw, a jolt-squeeze-pin strip, and a jolt-rock-over-foot draw machine.

Core and molding sand are tested in the sand laboratory which contains equipment for moisture, permeability, green strength, grain distribution, and clay content, as well as high temperature properties.

The 2½-ton per hour cupola is flanked by a 200-lb gas furnace (for aluminum alloys), two induction furnaces (primarily for steel), a 300-lb indirect arc furnace, and a 50-lb direct arc furnace. Two 500-lb covered transfer ladles suspended from the crane system handle metal between the melting and pouring areas. A hydraulic lift raises material from the unloading platform to the charging floor.

To analyze and control metal properties, the layout includes a metal testing laboratory equipped to make carbon and sulphur analyses, chill, fluidity, and hardness tests, as well as the various strength tests.

The cleaning room, containing the standard cleaning equipment, the utility and research room, and the storage rooms, were all designed to utilize space most economically.

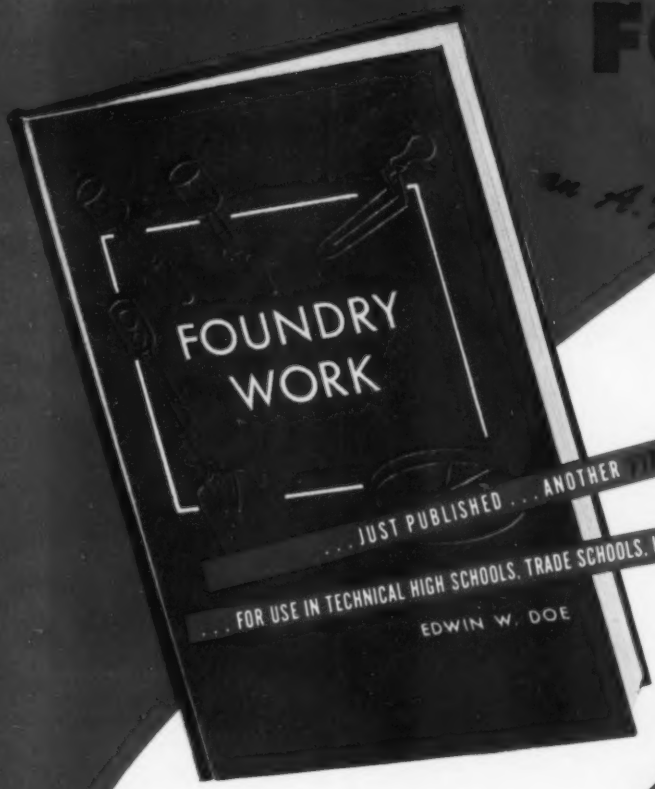
Modernization reflects the determination of Purdue to keep abreast of foundry needs for trained men.

Woman engineering student helps load airless blasting machine in cleaning area.

Face shields and leggings are standard equipment for all students during pouring. Molding sand on floor prevents splatter, protects concrete in case of spills or runouts.

Dumping molds on stationary shakeout grates, students use metal pushers to get sand onto under-floor conveyor belt which takes sand back to storage.

FOUNDRY WORK



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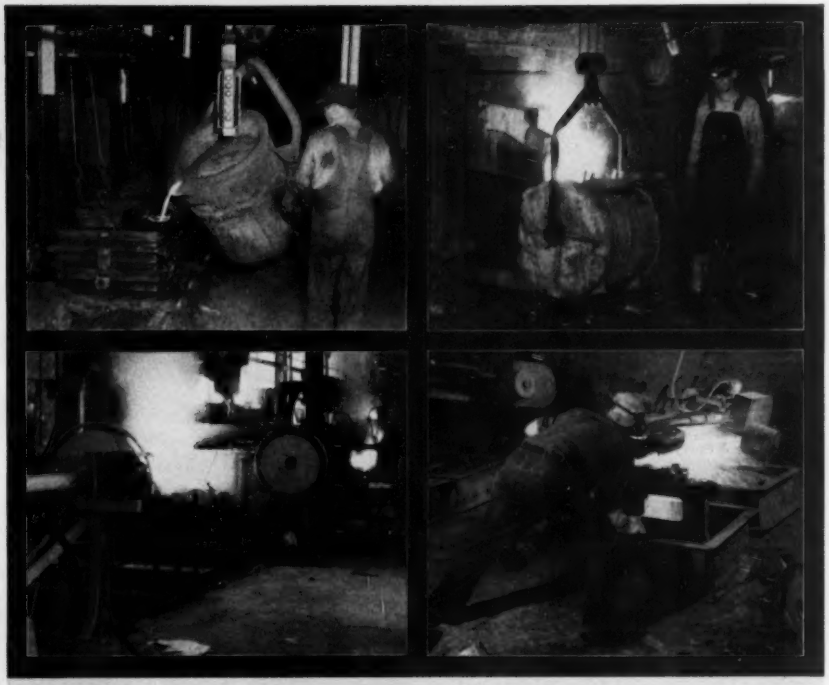

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Spheroidal graphite iron featured at

International Nickel open house

■ Present status of ductile iron was illustrated by production and testing of the material, and a display of typical commercial castings at the research laboratory of International Nickel Co., Bayonne, N. J., September 25.

Actual production of the metal, which has been witnessed by comparatively few foundrymen, involved the double inoculation of the iron. First (nodulizing) inoculation was performed by tapping the cupola directly onto the nickel-magnesium alloy resting on the bottom of the receiving ladle.

The magnesium flared with a brilliant white light reminiscent of the photographer's flash of days gone by and was best observed through the dark glass of a welder's hood. Some fuming of the magnesium and boiling of the iron occurred but metal splash was no greater than often accompanies an ordinary tap.

The second (graphitizing) inoculation was made in the usual way by first covering the bottom of the pouring ladle with metal from the receiver, then adding the ferrosilicon while metal continued to fill the pouring ladle.

The metal appeared slightly dull, possibly because of the contrast with the brilliant light of the burning magnesium, possibly because the temperature was being held down to avoid excessive loss of magnesium, possibly because the slag emissivity was lower than normal. The metal was highly fluid, nevertheless, and a number of knitting needles were cast as metal ran up through vents in the copes of some of the molds.

Iron with graphite in the spherulitic condition as-cast comes in a variety of mechanical properties. As-cast commercially, the material may have as little as 1 per cent elongation or as high as 10 per cent with ultimate tensile strength ranging from 85,000 psi to 100,000 psi. Annealed, the tensile drops off to 65,000 to 75,000 psi but elongation can go as high as 23 per cent. Normalizing or quenching, followed by drawing may boost the tensile strength to over 150,000 psi with elongation ranging between 4 and 10 per cent. Tensiles as high as 230,000 psi have been reported for heat treated ductile iron.

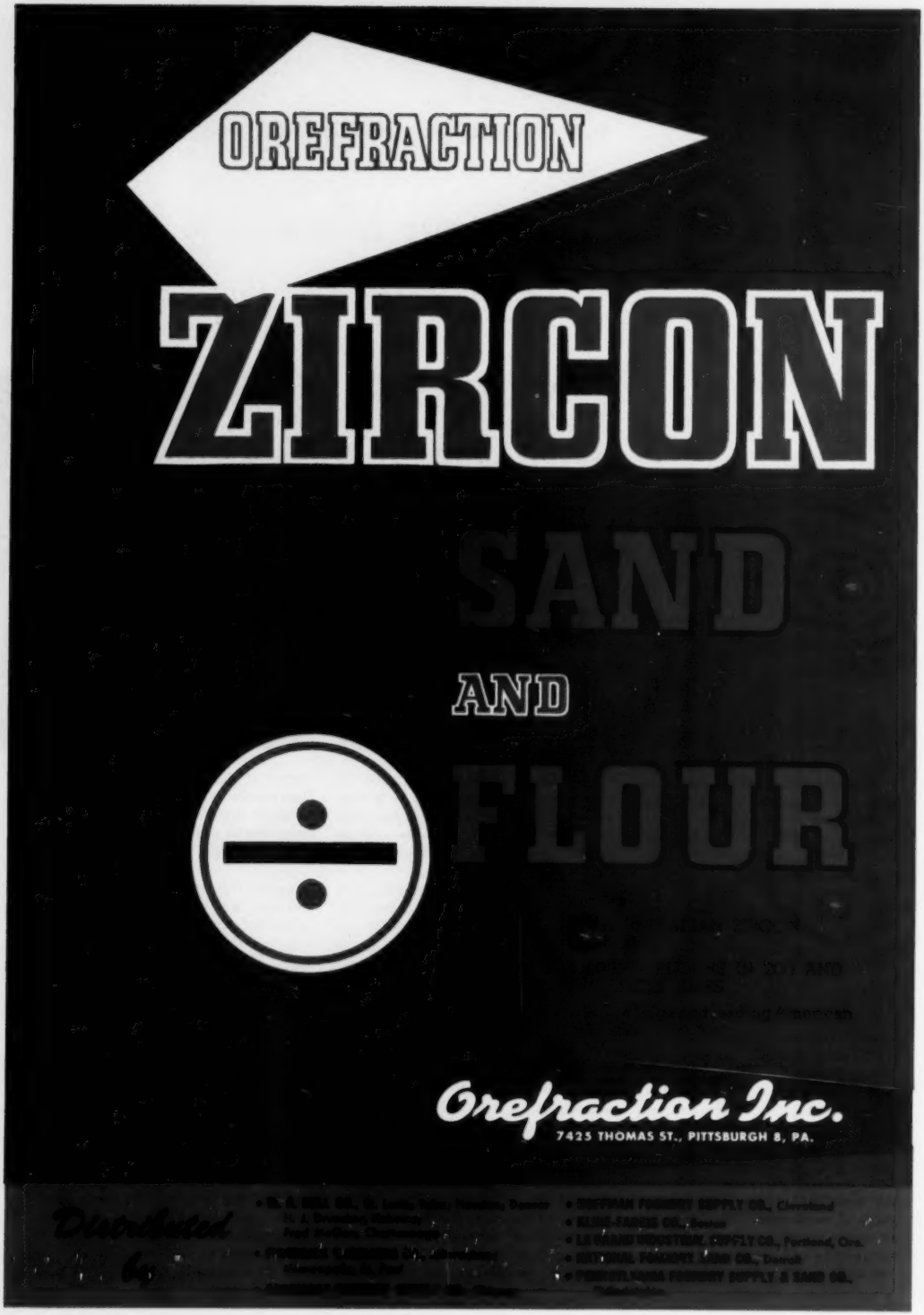
Magnesium flares as iron is tapped out onto nickel-magnesium alloy in bottom of ladle. Secondary inoculation with ferrosilicon is made in usual way as metal is transferred to pouring ladle.

Section of Class B arbitration bar cast from ductile iron gradually bent, finally broke on eighth blow of impact tester. Gray iron of approximately 40,000 psi tensile strength broke on first blow.

Inco lists over 500 regular applications for ductile iron and nearly 200 experimental uses.

Castings displayed ranged in size from a few ounces to several hundred pounds. (Anvil blocks up to 50 tons, 48 in. thick have been cast.) They illustrated, in the main, not replacement of non-cast parts with nodular iron but rather substitution for steel, malleable, gray iron and some non-ferrous castings. Each substitution was made for one or more of the following reasons: reduce cost, improve machineability, achieve ductility, increase tensile strength, for weldability, for resistance to heat or corrosion, for improved resistance to wear, galling, or seizing, for fatigue strength, and for damping properties.

Notable examples of substitution of ductile iron for a previously non-cast product were a cartridge heading die, formerly made of tool steel, and a jet engine main bearing support outer ring, which was originally designed for production as an aluminum forging. Shown with the heading die was the 875,000th cartridge produced; tool steel dies normally produce 45,000. Conversion of the jet part to nodular iron cut the cost to one-sixth.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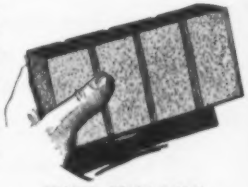

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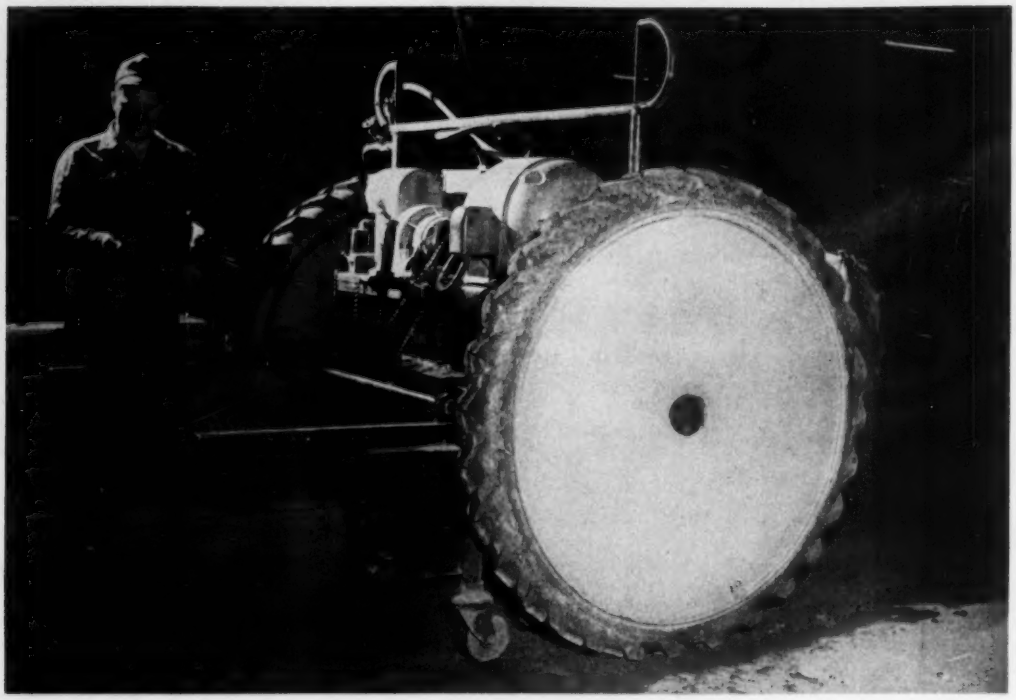

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A screen for removing trash and tramp iron and a water dispenser for accurately wetting down the sand as the machine travels over the heap are valuable added features.

The Moulders' Friend fits your foundry. Being carried on two large wheels it turns short and handles well in the crowded foundry.

The Moulders' Friend will help you keep in tune with the times by paying for itself with better castings and less labor cost. Investigate this remarkable machine today. See one in operation.

THE BRUSH DOES THE JOB

"The Moulders' Friend" ● Dallas City, Illinois

Another Malleable Foundry Prefers STERLING Flasks!

Here are some of the 600 sections of Sterling Type "L" Steel Flasks purchased recently, in a single order, by a large Midwestern malleable foundry. The flasks are being used for producing automotive castings. The same foundry also formerly purchased 1,100 sections of other styles of Sterling Steel Flasks. Sterlings were selected because of their greater accuracy and longer life. All-steel . . . all-welded . . . each section is fabricated into one solid, rigid piece . . . capable of withstanding tremendous pressures. The *heavy special rolled steel* sand flanges provide a full-width bearing that permits partings to be accurately machined — not just surface ground, but planed to an accuracy within .005". These features, plus the solid center rib and angle reinforcement assure longer flask life and a more profitable investment. When in need of flasks, or other foundry equipment, consult Sterling. Write for catalog.

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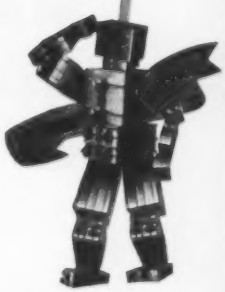

Sterlings are backed by almost a half century of "know how" in fabricating precision-built foundry flasks.

SIMPLICITY model V-S conveyors help speed production and cut costs of handling hot foundry sand

At a foundry producing a variety of malleable iron castings, this 36" x 30' Simplicity Model V-S Conveyor moves hot sand from two shakeouts up a 3° incline to an elevator at an average rate of 80 tons with a peak load of 120 tons per hour. As the sand moves along the conveyor, water is added and plows turn the sand thus reducing the sand temperature 100°. The sand is discharged into the elevator boot over a permanent magnet that removes all metal particles.

Simplicity Conveyors and Os-A-Veyors greatly simplify the movement of sand and castings and hot abrasive materials in foundries. They can be installed to carry most any type or quantity of material you need. Simplicity Conveyors and Os-A-Veyors are easy and inexpensive to operate, maintain and repair.

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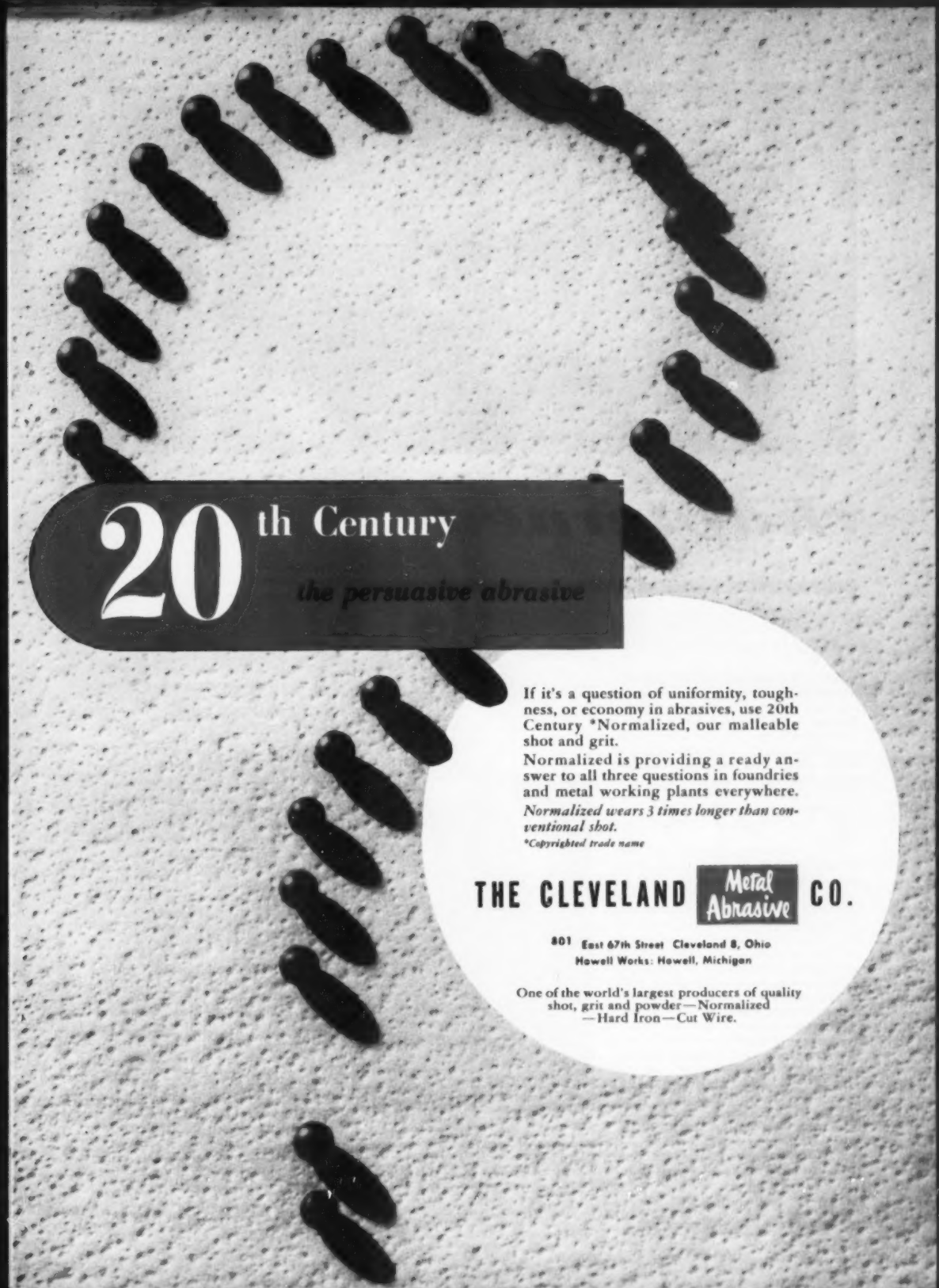
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If it's a question of uniformity, toughness, or economy in abrasives, use 20th Century *Normalized, our malleable shot and grit.
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One of the world's largest producers of quality shot, grit and powder—Normalized —Hard Iron—Cut Wire.

Officers and directors of the Central Indiana Chapter were guests of their fellow director E. G. Richardson at the Delco Remy Div., General Motors Corp., Anderson, Ind., August 12. Following lunch, Superintendent Richardson gave an illustrated lecture on the foundry, then conducted his guests on a plant tour, according to Chapter Reporter Wm. H. Faust, Electric Steel Castings Co.

chapternews

Iron works restoration

Restoration program for the century-old deserted village of Allaire, N. J., has been endorsed by the Metropolitan Chapter, according to J. S. Vanick, International Nickel Co., New York, chairman of the chapter. Complete restoration of the village would include rebuilding of an iron works—the old stack still exists—along with other buildings still standing including an old mill, inn, firehouse and equipment, and several homes.

Bog ore made the area important even in Revolutionary days when the village site was known as Monmouth Furnace. James P. Allaire, shipbuilding associate of Robert Fulton, bought the furnace in 1823 to supply pig iron for his New York shipyards. The bog ore was smelted with charcoal to produce pots, kettles, stoves, pipes, pans, and sad irons, as well as pig.

The furnace flourished until the panic of 1837 and the discovery of coal and iron in Pennsylvania. Up to that time Allaire had become a thriving village. Erected between 1827 and 1831 were a furnace, store, carpenter and blacksmith shops, file and screw factories, saw and grist mills, dwellings and stables, a high school, and a church. Original wood structures were replaced in 1832 with brick which was manufactured locally. With currency scarce, the firm even printed its own money showing an engraving of the furnace, a vignette of Benjamin Franklin, and the signature of James P. Allaire.

Cost of restoration of the village and the iron works is estimated in the millions and an initial appropriation of $150,000 has been asked of the state legislature. In preparation for the restoration, which has been announced several times since 1940, the forests and parks section of the Department of Conservation and Economic Development of New Jersey has prepared a model of the area as it appeared 115 years ago at the height of its prosperity.

Brick furnace stack is all that remains of a once-prosperous iron works in the deserted village of Allaire, N. J. The Metropolitan Chapter is interested in its restoration.

Northeastern Ohio

JACK C. MISKE
Foundry

Over 175 members and guests attended the clambake and technical meeting which opened the 1952-53 season of Northeastern Ohio Chapter at the Tudor Arms Hotel, Cleveland, September 11.

After a social hour, the dinner and a short recess, members reconvened to hear William Hisey of the public relations department, Goodyear Tire & Rubber Co., Akron, Ohio, deliver a talk on "*The Road Back.*" Inspirational in nature, Mr. Hisey's address dealt with his concern for values which he feels America has been losing for over 20 years and which he feels must be regained before the country can get back on the road originally mapped out and started down by the nation's founders.

He pointed out that the men who dreamed of America as a place where all men could live in freedom and peace —as God meant the whole world to live ultimately—felt that the only way to achieve what men desire and God intended is through work. Mr. Hisey pointed out that today too many of us

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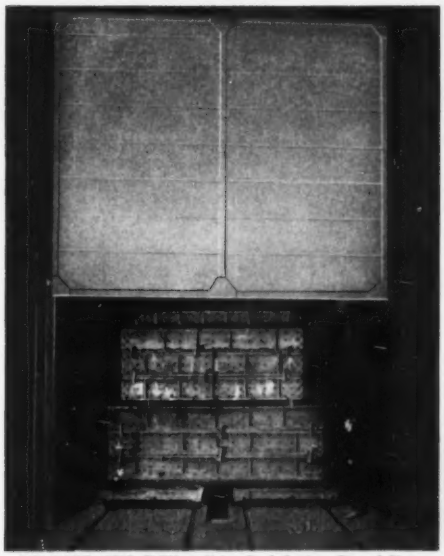
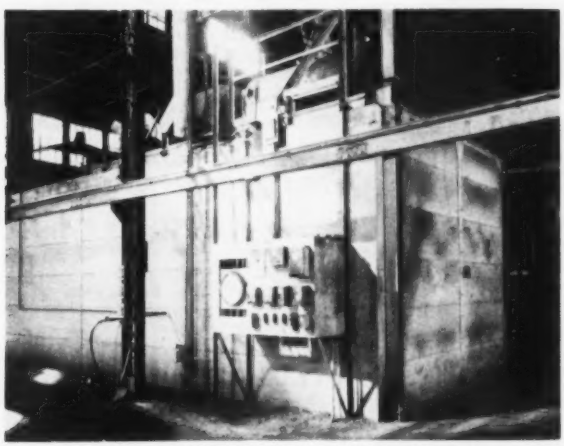
is held in so high esteem by outstanding foundries such as those listed below.



CARL-MAYER MOLD OVEN at Union Steel Castings Div. of Blaw-Knox Company. Door clearance: 17'-9" wide, 15' high. Depth: 40'. Capacity: 200 tons per bake. Combination gas-oil fired.

CORE *and* MOLD OVENS, *all types*



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Pittsburgh Steel Foundry Corp.
H. B. Salter Co.
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Over thirty years' experience

Paul Kerdiak (right), Scott-Atwater Foundry Co., Minneapolis, receives trophy for best golf score (second successive year) from Chapter Chairman J. W. Costello, American Hoist & Derrick Co., St. Paul, Minn., at Twin City Chapter's annual golf outing at Midland Hills Country Club. Seated left is J. S. Garske, Progress Pattern & Foundry Co., St. Paul, outing chairman.

are likely to feel that there is an easier, faster way to satisfy those needs and that work is somehow without dignity, to be avoided, or, if it cannot be avoided, to be called by some more euphemistic name.

Birmingham District

J. P. MC CLENDON
Stockham Valves & Fittings, Inc.

Some 775 foundrymen and friends attended the 19th annual outing and barbecue of the Birmingham District Chapter at Cascade Plunge September 13. Chapter Chairman Fred K. Brown, Fred K. Brown Co., Inc., joined past chairmen James T. MacKenzie, American Cast Iron Pipe Co., C. P. Caldwell, Caldwell Foundry & Machine Co., Inc., T. H. Benners, T. H. Benners & Co., and Joe T. Gilbert and Morris L. Hawkins, both of Stockham Valves & Fittings, Inc., in introducing visitors and entertaining guests. Largest delegation, headed by Stephen D. Moxley, was from American Cast Iron Pipe Co.

Attendance prizes arranged by E. M. Whelchel, American Cast Iron Pipe Co., and his committee numbered over 30 with a total value approaching $500. Top prize was an automatic target rifle. The Entertainment Committee in charge of all arrangements included: Wm. K. Bach, Foundry Service Co., chairman; Ross Martin, Jr., McWane Cast Iron Pipe Co., Vernice I. Byford, Jackson Industries Inc., Wesley J. Estes, U. S. Pipe & Foundry Co., and Joe T. Gilbert, Stockham Valves & Fittings, all of Birmingham; and Henry Guthrie, DeBardeleben Coal Corp., East Tuscaloosa.

At a recent meeting of the chapter directors, John F. Drenning, Kerchner, Marshall & Co., secretary-treasurer, announced that membership had increased from 256 to 292 since July 1, 1951, under direction of Donald C. Abbott, Hill & Griffith Co. T. H. Benners, Jr., chairman of the Educational Committee requested and received an increased budget allowance for apprentice contests.

Model of Allaire as it looked 115 years ago prepared by the forests and parks section of the New Jersey Department of Conservation and Economic Development which furnished photos.

Northern California

Roster of the Northern California Chapter for 1952-53 was recently issued. In addition to listing members, the roster includes separate listings of pattern shops, foundries, and supply and service organizations on the Northern California area.

Dedication of the roster by Philip C. Rodger, General Metals Corp., Oakland, immediate past president of the chapter, reads: "The future success of the foundry industry is dependent upon technical advancement, which the American Foundrymen's Society so capably sponsors. This roster is dedicated to the many technicians who have worked so industriously to technically improve all branches of the foundry industry."

Roster Committee consisted of Donald C. Caudron, Pacific Brass Foundry, San Francisco; John G. Campbell, Pacific Steel Casting Co., Berkeley; William S. Laidley, Vulcan Steel Foundry, San Francisco; and Roy C. Wendelbo, De Sanno, Foundry & Machine Co., Oakland.

Tri-State Chapter

F. E. FOGG
Acme Foundry & Machine Co.

Fifty-two members heard A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, speak on *"Patternmaking"* at the September 12 meeting at the Alvin Hotel, Tulsa. Mr. Pfeiffer illustrated his remarks with exhibits which he used to point up his recommendation that wooden models of complicated castings be made for study before designing pattern and core box equipment. The models, he said, avoid many expensive pattern changes. In cases where several foundries produce castings from the same pattern equipment, he recommended Allis-Chalmers' practice of calling in representatives of foundries concerned so that ample consideration can be given to their production facilities before pattern equipment is designed.

St. Louis District

FRED J. BOENEKER
Bronze Alloys Co.

Considerable interest in the work of the Foundry Educational Foundation was evident at the September 11 meeting of the St. Louis District Chapter, when Marion J. Allen, American Steel Foundries, Chicago, described the many tangible benefits which have accrued to the foundry industry as a direct result of the work of the foundation in American universities. He was introduced by Lloyd C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill.

Mr. Allen, who is president of FEF,

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Birmingham District Chapter annual outing committee members pose with chapter officers at the 19th annual outing and barbecue. Front row, left to right, are: John F. Dronning, Kerchner, Marshall & Co., secretary-treasurer; Fred K. Brown, Fred K. Brown Co., Inc., chapter chairman; Joe T. Gilbert, and Elliott M. Cranford, entertainment chairman, both of Stockham Valves & Fittings. Left to right in back are: E. M. Wheichel, American Cast Iron Pipe Co.; R. B. Biddle; Wm. K. Bach, Foundry Service Co.; and Vernice I. Byford, Jackson Industries Inc.

William Romanoff (center), H. Kramer & Co., Chicago, spoke at Central Michigan Chapter's opening meeting. Chapter Chairman D. W. Boyd, Engineering Castings, Inc., Marshall, Mich., is at left. Right is K. W. Rhoads, Engineering Castings, technical chairman of the meeting.

Snapped at the September 12 meeting of the Southern California Chapter were, left to right: Harold G. Pagenkopp, Angelus Pattern Works, Huntington Park, chapter president; A.F.S. Technical Director S. C. Massari, Chicago, speaker; and Hubert Chappie, National Supply Co., Torrance, secretary. Meeting featured latest A.F.S. film on gating design.

cited the enthusiasm which permeates the activities of the foundation, stating that "somewhere within the metals casting industries during the past ten years a spark of greatness came to life, and we in the foundation feel that we are a reflection of this inner urge within the industry itself." An illustrated statistical presentation by George K. Dreher, executive director of FEF, portrayed the progress made since the foundation's inception.

Dean Curtis L. Wilson and Dr. D. E. Eppelsheimer, of the Missouri School of Mines & Metallurgy, were present and Dean Wilson thanked FEF and the St. Louis District Chapter for its assistance in the development of the school's foundry program. He expressed special thanks to the committee headed by A. L. Hunt, chapter educational chairman, of National Bearing Div., American Brake Shoe Co., St. Louis.

Chairman Henry W. Meyer, General Steel Castings Corp., Granite City, Ill., presided over the meeting, which was attended by approximately a hundred foundrymen and friends of the chapter.

Twin City Chapter

R. J. MULLIGAN
Archer-Daniels-Midland Co.

An extensive educational program is only one of a number of projects being pressed this year by the Twin City Chapter under the chairmanship of Joseph W. Costello, American Hoist & Derrick Co., St. Paul, Minn. Heading the Educational Committee, which is on the move to show high school, vocational school, and college students, as well as apprentices, the merits of a foundry career, is J. David Johnson, Archer-Daniels-Midland Co., Minneapolis.

At the November meeting, to be held at the Covered Wagon, Minneapolis, on the 11th, George K. Dreher, Foundry Educational Foundation, Cleveland, will speak on *"Youth Encouragement."* The Educational Committee has selected a number of students from Twin City schools to attend as guests of the chapter.

Again this year, Paul Kordiak, Scott-Atwater Foundry Co., Minneapolis, led Twin City Chapter golfers at the annual outing at Midland Hills Country Club. He is a two-time winner of the chapter's permanent trophy. Lloyd King, King Foundry, Inc., Minneapolis, won the handicap. Directing the outing was Joseph S. Garske, Progress Pattern & Foundry Co., St. Paul.

Corn Belt Chapter

VERN HOLMES
Paxton-Mitchell Co.

Fall opening meeting of the Corn Belt Chapter took place at the Castle Hotel, Omaha, September 5. About 47 members and guests heard A. F. Pfeiffer, Allis-Chalmers Co., Milwaukee, speak on *"Co-ordinative Functions of Patterns and Castings."* Guests from

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other chapters included: Mo-Kan—Lloyd Canfield, Canfield Foundry Supplies & Equipment, Kansas City, Kan.; Wisconsin—Seward E. Shaver, Archer-Daniels-Midland Co., Milwaukee; and Quad City—W. E. Jones, Federal Foundry Supply Co., Davenport, Iowa.

Southern California

K. F. SHECKLER
Calmo Engineering Co.

First meeting of the Southern California Chapter for the 1952-53 season, was held at Rodger Young Auditorium, Los Angeles, the evening of September 12, and was attended by approximately 130 members and their guests. After a short welcoming address by President Harold Pagenkopp, Angelus Pattern Works, Huntington Park, it was reported by the membership chairman, O. J. Stoudt, Brumley-Donaldson Co., Huntington Park, that the chapter has already attained its membership quota for the current year.

Hubert Chappie, National Supply Co., Torrance, introduced S. C. Massari, technical director of the American Foundrymen's Society, who discussed principles of gating and presented a motion picture on the *"Effect of Gating Design on Casting Quality."*

On August 16, the Southern California Chapter held its annual summer outing and stag at Lakewood Country Club, Long Beach. The afternoon and evening were thoroughly enjoyed by a record crowd of approximately five hundred foundrymen and their guests. One hundred golfers entered the tournament.

The soft ball game, between the Foundrymen and the Peddlers, brought forth hidden talent in pitching and hitting, as well as a number of sore muscles, as a result of fielding and base running. The horseshoe pitching contest rounded out the athletic program.

J. A. Oliva, Oliva-Tatro Co., Los Angeles, Anthony Tuzzolino and Frank Oliver of Overton Foundry, South Gate, and Amos N. Culp, West Coast Foundry & Mfg. Co., Los Angeles, handled the barbecue and beer stand. A committee headed by Robert M. Ditmore, Federated Metals Div., American Smelting & Refining Co., Los Angeles, was in over-all charge of arrangements.

Metropolitan

First to announce its participation in the 1953 A.F.S. Apprentice Contest is the Metropolitan Chapter. As a result of the local contest, the chapter will be eligible to be represented by three contestants in each of the five contest divisions when final judging takes place in Chicago next spring prior to the 1953 Convention.

Competition is open in gray iron molding, steel molding, non-ferrous molding, wood patternmaking, and metal patternmaking. All bona-fide apprentices not over 24 years of age at the time they make their mold or pattern

Marion J. Allen, American Steel Foundries, Chicago, outlining Foundry Education Foundation progress and plans at the September 11 meeting of the St. Louis District Chapter.

are eligible. Veterans are eligible if their age less term of service in the Armed Forces does not exceed 24.

Prizes in the national contest are $100, $50, and $25 for first, second, and third place in each of the five divisions. First prize winner in each division will also receive round trip fare and Pullman to Chicago for appearance at the Annual Meeting. In addition, the Metropolitan Chapter will award prizes to local contest winners.

Apprentices from any plant may enter. They need not be members of the Society, nor is membership by someone in their plant necessary to make them eligible. Patterns for the molding contests and blueprints for the pattern contests are furnished by the Society. Metropolitan Chapter-area shops interested in the contest should contact Robert R. Waltien, 8935—116th St., Richmond Hill 18, N. Y., or Frederick R. Wiehl, 121 Paterson Rd., Fanwood, N. J. In other areas, write to Jos. E. Foster, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

▶ *Other organizations*

New England

MYRON DE HOLLANDER
General Electric Co.

Seventy-five members and guests attended the first fall dinner meeting of the New England Foundrymen's Association held at Hotel Somerset, Boston, September 10. Albert M. Nutter, E. L. Le Baron Foundry Co., Brockton, Mass., secretary-treasury, presided over a short business meeting before introducing the speaker. J. Healy, director of the special commission on taxation for Massachusetts, spoke on problems, activities, and procedures of state legislative bodies.

Meeting attendants were reminded of the 12th annual regional conference to be held at Massachusetts Institute of Technology on October 24 and 25.

Reading

W. I. CASSIDY
Secretary

History of metals from the Stone Age to the Atomic Age was described by Guy A. Pealer, General Electric Co., Elmira, N. Y., at the September 16 meeting of the Reading Foundrymen's Association at the Berkshire Hotel, Reading, Pa. He traced iron from its first intentional production about 1500 B.C., pointing out the importance of powers of observation and action which man has exercised in his gradual development of metals and their use.

Association President James Hinkley welcomed the 150 guests at the meeting, including 50 industrial arts teachers from Berks, Lancaster, Lebanon, Lehigh, and Montgomery counties.

George K. Dreher, Foundry Educational Foundation, Cleveland, speaking at the St. Louis District Chapter meeting September 11. Seated, left to right, are: Dr. D. E. Epplesheimer, Missouri School of Mines; Lloyd C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill.; Henry W. Meyer, General Steel Castings Corp., Granite City, Ill.; Dean Curtis Wilson, Missouri School of Mines; and A. L. Hunt, National Bearing Div., American Brake Shoe Co., St. Louis.

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When Eddie Gutkowski, Cleaning Room Foreman at General Foundries, Milwaukee, decided to try Malleabrasive, he hoped to realize a 50% savings on maintenance and parts. "Actually," Eddie reports, "we have saved more than that!" What's more, "Malleabrasive costs far less *per ton of castings cleaned!*" Ray Maas, Maintenance Superintendent, agrees completely. "Malleabrasive lasts much longer than any other abrasive we have ever used," he says. And it turns out a cleaning job like the one you see above!

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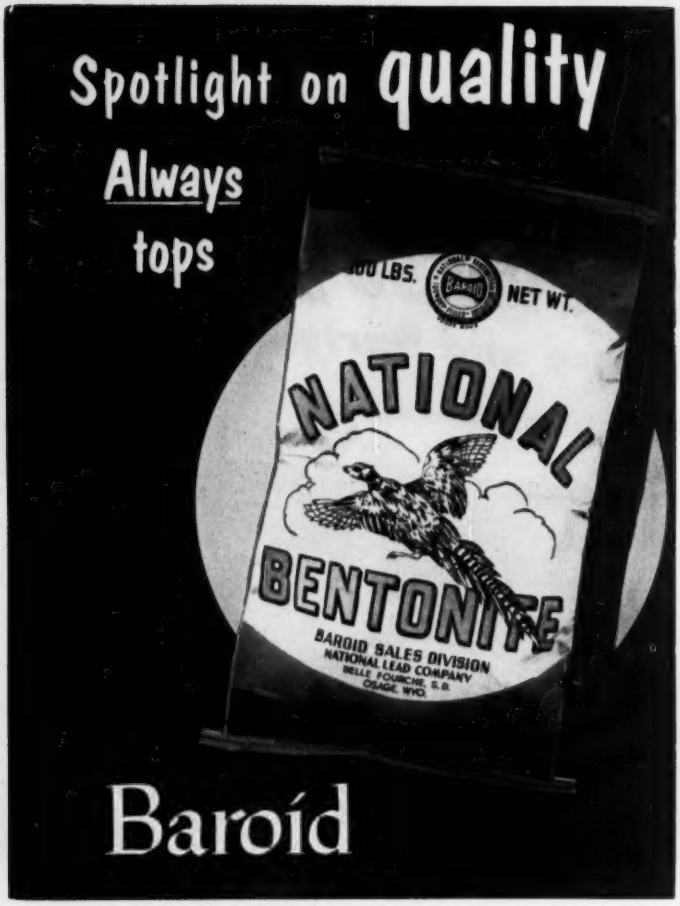

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news of technical committees

Timestudy and methods

The *Timestudy Handbook* and the 1953 Convention were major considerations when the Timestudy and Methods Committee met in the Congress Hotel, Chicago, September 12. A discussion of a tentative table of contents for the handbook indicated that among the chapters would be sections on work simplification, both the factor comparison and the point system methods of job evaluation, and a comprehensive bibliography.

In planning for its sessions during next year's A.F.S. Convention in Chicago, May 4-8, the committee decided to devote the entire Wednesday, May 6 session from 4:00 to 6:00 p.m. to a paper dealing with indirect labor incentives. To be presented by C. J. Pruet, McWane Cast Iron Pipe Co., Birmingham, Ala., the material will be a composite of papers by Milton T. Sell, Sterling Foundry Co., Wellington, Ohio, H. C. Rowe, Bullard Co., Fairfield, Conn., and Mr. Pruet. On the following day at the same time L. L. Martin, Norfolk Navy Yard, Portsmouth, Va., and Everett Reid, Ford Motor Co. of Canadian, Ltd., Windsor, Ont., will present papers on, respectively, *"Core Finishing Standards,"* and *"Conveyor Molding Standards."*

Chairman M. E. Annich, American Brake Shoe Co., Mahwah, N. J., asked to be relieved of his duties as head of the Timestudy and Methods Committee, and recommended that Mr. Sell be elected. The committee voted unanimously to name Mr. Sell, chairman of the Timestudy and Methods Committee.

Attending the meeting were the following: Mr. Annich; J. J. Farkas, Cincinnati Milling Co., Cincinnati; J. E. Foster, A.F.S. technical assistant; L. W. Lehmann, John Deere, Van Brundt Co., Horicon, Wis.; M. E. Mundel, Rock Island Arsenal, Rock Island, Ill.; Mr. Rowe; Dean Van Order, Burnside Steel Foundry Co., Chicago; J. A. Westover Westover Engineers, Milwaukee, Wis.; H. R. Williams, Williams Management & Engineering, Milwaukee; and Messrs. Reid, Pruet, and Sell.

Gray iron program

The entire gray iron program including papers for the technical sessions, speakers and topics for the Gray Iron Shop Course, and the program for the Gray Iron Roundtable Luncheon were set up at a meeting of the Gray Iron

Program and Papers Committee in Chicago, August 12. In addition to participating in the Symposium on Sand Reclamation, the division has tentatively scheduled papers on cupola operation, heat treatment of cast iron, casting reclamation, gray iron machinability, and fundamentals of solidification. Probable subjects for the Gray Iron Shop Course include "*Gating, Risering, and Pouring and Its Relation to Scrap*," "*Chill Control*," and "*Carbon Pickup in the Cupola*." Topic for discussion at the Gray Iron Roundtable Luncheon is "Scrap Reduction."

Instituting a new procedure, the committee will meet about the middle of January 1953 to make a final review of papers and to make final selections for presentation during the Convention.

Present at the meeting were: Committee Chairman J. A. Vanick, International Nickel Co., New York; C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.; R. A. Clark, Electrical Metallurgical Div., Union Carbide & Carbon Corp., Detroit; F. T. McGuire, Deere & Co., Moline, Ill.; K. H. Priestley, Vasser Electroloy Co., Vasser, Mich.; E. J. Burke, Hanna Furnace Corp., Buffalo, and A.F.S. Technical Director S. C. Massari.

Light metals

The Light Metals Division (formerly Aluminum & Magnesium) will hold five technical sessions, a roundtable luncheon and its annual divisional business meeting May 4 and 5, 1953, during next year's A.F.S. Convention. This was decided at a meeting of the Executive Committee at the Congress Hotel, August 20. In addition to planning for the 1953 Convention, the committee also reviewed activities of a number of committees in the division.

New in the Light Metals Division is the Shell Molding Committee which held its first meeting on August 19. The committee is planning several papers on shell molding and also has suggested this subject for a roundtable discussion. Also suggested for the roundtable by the Executive Comittee is a discussion of surface finishes.

Titanium a new subject for the Light Metals Division will be covered at two of the five Convention sessions. Already scheduled are a paper on properties of cast titanium and a new color film on casting titanium. Among aluminum and magnesium papers expected to be presented are the following subjects: Aluminum permanent molding, turbulence defects in permanent mold castings, permanent molding of magnesium, rare earth-aluminum alloys, properties of magnesium-rare earth alloys, casting of magnesium in shell molds, statistical quality control, gating principles as applied to aluminum, die casting, and relationship of mold hardness to properties of aluminum alloy castings. Looking ahead to 1954, the committee has ten-

continued on page 112

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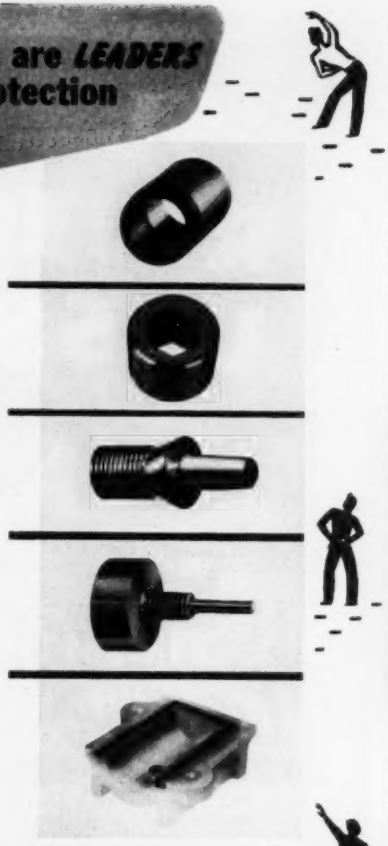

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foundrymen

continued from page 32

at the Mare Island Naval Shipyard, Mare Island, Calif. Shortly thereafter he was transferred to the Puget Sound Naval Shipyard where he has been employed since.

Clyde A. Sanders and **Arthur G. Clem** have the first paper they have written together for the foundry industry on page 48 where they tell how to interpret sand test data developed by preparing otherwise standard specimens with a varying number of rams. A frequent contributor

Clyde A. Sanders

to AMERICAN FOUNDRYMAN, Mr. Sanders is vice-president of American Colloid Co., Chicago. He is chairman of the Sand Division and a popular speaker at chapter meetings and regional conferences. Mr. Clem, a newcomer to the foundry literature has been chief chemist of American Colloid since 1948, having been chemist with the same company the previous eight years.

Norman Pintchuk has joined Solar Aircraft Company's San Diego plant as metallurgist in the Solar's stainless steel foundry. He will devote most of his time to improving techniques in shell mold casting.

Henry M. Clouse has become an assistant engineer in Allis-Chalmers (Milwaukee) foundries and pattern shops. He completed the company's graduate training program after graduating from the University of Pittsburgh in 1950.

Joseph T. Bailey and Dwight E. Ellzey have been designated sales representatives of the Pre-Engineered Div. of Mechanical Handling Systems, Inc., Detroit. Mr. Bailey is located at 718 Market St., Knoxville, Tenn. Mr. Dwight E. Ellzey is at 1718-A 28 Ave S., Birmingham 9, Ala.

Walter S. Schamel has been designated district manager of the Los Angeles of-

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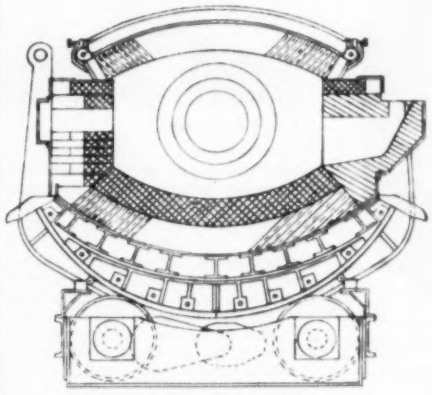
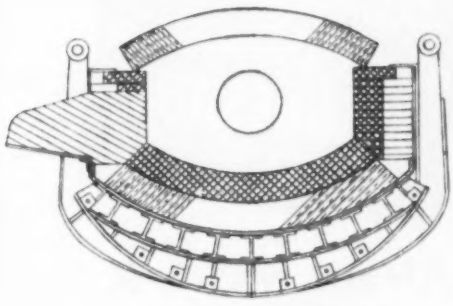


Section through Pour-in Spout



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TASIL sidewalls and bottom 9" thick. TASIL top course in sidewall 13½" thick.

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fice for American Wheelabrator & Equipment Corp., Mishawaka, Ind. He opened new offices at 3155 Leonis Blvd., Vernon, Los Angeles 58, on August 1.

William J. Taylor was appointed president of Exothermic Alloys Sales and Service, Inc., Bridgeville, Pa. William F. Skeer, vice-president and Gordon B. Thomson, secretary-treasurer.

▶ *Obituaries*

Paul F. Nydegger, retired superintendent of Singer Manufacturing Co., Elizabeth, N. J., died while on a motor trip in California. He was 77. A native of Switzerland, Mr. Nydegger came to the United States as a youth and began work with Singer shortly thereafter. He retired three years ago after 51 years of service. Starting as a toolmaker, he was promoted in 1903 to manager of the assembly partment. In 1911 he was made manager of the oil milling department and the next year named superintendent of a former Singer plant in Germany. He held that post until 1919 when he was appointed works manager of the Singer plant in St. John's, Quebec. The following year he was appointed superintendent of the Elizabeth factory. During his association with Singer he introduced many new operations and methods, and played an important part in modernizing the company's foundry and material handling operations, and in transportation and storing.

Paul F. Nydegger

Max F. Becker, president of M. F. Becker and Associates, Chicago, died August 28 after a prolonged illness. Mr. Becker, who began his career with the Whiting Corp., Harvey, Ill., in 1920 remained with them until 1945 when as vice-president in charge of the equipment division he left to become an independent manufacturer's representative. He was chairman of the A.F.S. Chicago Chapter in 1943-44.

Chester P. Guion, manufacturers' representative with offices at 1661 N. Milwaukee Ave., Chicago, was killed in an automobile accident near Volo, Ill., August 31. Mr. Guion began his career in 1916 as foundry superintendent for the

Garland Mfg. Co., Des Plaines, Ill. Subsequently he was employed in the sales and engineering divisions of the Charles Kawin Engineering Co., Chicago (1918), and the W. W. Sly Mfg. Co., Cleveland (1920). In 1932 he established himself as an independent manufacturers' agent, retaining the W. W. Sly account and acquiring such new clients as the Royer Foundry & Machine Co., Kingston, Pa., and the Kirk & Blum Mfg. Co., Cincinnati. In 1935 he became manufacturer's representative for the National Engineering Co., Chicago, one

Chester P. Guion

of his chief accounts until the time of his death. A member of A.F.S. since 1926, Mr. Guion contributed much time and effort to development of the Society's safety, hygiene and air-pollution program. In a statement of appreciation made recently by J. R. Allen of the International Harvester Co., Chicago, chairman of the Society's S & H & AP Steering Committee, it was pointed out that Mr. Guion served on committees which were responsible for most of the Codes of Recommended Practices now generally accepted by industry as a whole as its safety-and-hygiene bible. Codes he helped devise include *"Testing and Measuring Air Flow and Exhaust"* and *"Grinding, Polishing and Buffing Equipment Sanitation"* (both in 1937); *"Fundamentals of Design, Construction and Maintenance of Exhaust Systems"* (1938); *"Good Practices for Metal Cleaning Sanitation"* (1939); *"Safety Practice for Protection of Workers in Foundries"* (1940); and *"Recommended Practices for Industrial Housekeeping and Sanitation."* (1944). In addition, Mr. Guion helped set up the *"Code of Recommended Practices for the Defense of Industrial Properties"* which won nation-wide acceptance during World War II. In concluding his statement, Mr. Allen said: "Chet Guion was a broad-gauge man who never hesitated to put our common good above any consideration of personal advancement. Industry as a whole owes him a debt of deep gratitude."

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free information

continued from page 18

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sired finish in the desired length of time. *Hickman, Williams & Company, Inc.*

1010 Counterflo heaters

Principal addition to this revised bulletin is information concerning use of heaters for eight other applications besides space heating. These are functional heating, process drying, temporary heating, medium temperature drying, tempering make-up air, drying vehicles after washing, crop drying, and integration with air conditioning systems. Heaters are direct-fired either with gas or oil and are supplied in standard output capacities ranging from 400,000 to 2,000,000 Btu per hour. *Dravo Corp.*

1011 Equipment catalog

A 36-page pocket size booklet illustrated with 100 pictures showing rock drilling equipment, air and electric tools and hoists, air and gas compressors, gas and diesel engines, centrifugal blowers, centrifugal and propeller pumps, vacuum and condensing equipment and refrigerating units. *Ingersoll-Rand.*

1012 Temperature controller

Description of new thermo-electronic signaling temperature controller and resistance bulbs, and charts which explain operating principle of the controllers, are contained in an 86-page catalog. *Thermo Electric Co., Inc.*

1013 Air processing

First in a series of three folders dealing with meaning and range of air processing ..what it means..how it is done..what it requires..what it should cost..where to go for it. Articles explain basic principles employed in systems for scientific use of air to improve manufacturing operations. *J. O. Ross Engineering Corp.*

1014 Lift trucks

Bulletin 525, presents hydraulic lift trucks which fit into current trend to move materials and goods in larger loads. Trucks have been designed for easy, safe one-man handling of heavy skid and box loads. Features include: complete hydraulic lifting and lowering; easy travel, wide spread front wheels for stability, fully enclosed pump and ram, spring handle hold-up to keep handle in safe position, and easily removable hydraulic unit. *Barrett-Cravens Co.*

1015 Colloidal graphite

Bulletin on "Colloidal Graphite for Surface Coatings and Impregnation" describes an electric furnace graphite of high purity, when rendered colloidal and dispersed in a suitable carrier, is finding new uses as a dry-film lubricant. It is used as a surface coating for many mechanical devices, and is recommended as an impregnating medium for a variety of materials including porous minerals, cloth, felt, leather, asbestos and paper. *Acheson Colloids Co.*

1016 Polishing materials

Twenty-page booklet, "Metallurgical Polishing Materials" describes and includes sample of emery, aluminum oxide, and silicon carbide papers, also twelve polishing cloths. Trade names, particle sizes, etc., for many abrasives given. *Buehler Ltd.*

1017 Battelle

Two color, brochure illustrated with photographs and drawings presents scope of Battelle's research in six fields of engineering economics—industrial market research, raw materials studies, diversification studies, research planning, industrial logistics and plant location, and operations research. Much of this research is financed from the Institute's endowment, and results are published for the general encouragement of science and industry, and to benefit the public welfare. *Battelle Memorial Institute.*

1018 Glossary

Glossary of 150 technical terms used between suppliers and users of ferrous and non-ferrous castings. Should prove useful to the designer, machinist and purchaser of castings as well as to the man in a foundry. *International Nickel Co., Inc.*

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- PARASPRAY provides complete moisture control. *A PARASPRAY* film on surface of core or mold *PREVENTS MOISTURE* absorption or loss from molds in green sand work; especially where synthetic sands are used.
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Letters

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Protests college graduates

Recently my company started hiring college trainees though for many years it had followed a policy of promoting from the ranks. Evidently the company thinks it is getting them ready-made and won't have to build men with brains and character as it used to.

I guess I can see how new educated blood can be an asset to an organization but not if it means antagonizing proven employees. Not if they lose confidence and initiative.

Why do the graduates get special consideration, greater opportunity, and higher starting salaries than those of us with practical experience and years of service? If they are so capable, why not let them stand on their own feet among the rest of us? Their own brilliance should make them rise without being pulled and pushed up the ladder.

When a company, which for many years has promoted from within, brings in college men without mentioning where they fit into the future plans of the company it makes the fellows without a degree but with hopes of becoming junior executives wonder what's the use. How much importance should be attached to a college degree? How many years of experience does it equal?

People don't mind working for low pay, even though they feel they're under-paid, if they think that some day they'll make it up. But if the opportunity to advance or to prove their ability is taken from them, they resent it and won't work hard because there's no incentive.

One break the college trainees get is more flexibility in their work. They aren't tied down to a job but roam the shop solving problems out of the realm of the ordinary worker. This gives them more opportunity to learn about various types of work in the shop.

I think my company has exaggerated the importance of college graduates, who have proven only that they have the ability to absorb knowledge. I am a firm believer in local talent and think that any advantage in opportunity should belong to experienced men. Maybe if a little of the attention and generosity being heaped on the college trainees were diverted to the long-time employees the results would be just as useful to the company.

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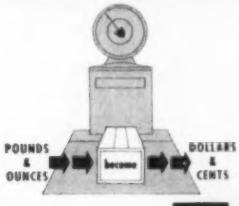

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abstracts

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Gray iron volume sensitivity

A230.."Volume Sensitivity of Gray Cast Iron," Gustav Meyersburg, *Gjuteriet*, Vol. 42, No. 5, May 1952, pp. 71-82. (In Swedish)

The strength of a specimen varies with its volume. A small volume gives a higher strength than a big one, structures being identical. This phenomenon, described as volume sensitivity, is caused by statistically distributed defects in the crystal lettice. The volume sensitivity of gray cast iron has been analyzed for transverse load, torque, and cutting. It was found to be lowest for the transverse load and highest for cutting. A transformation of volume sensitivity from one type of stress to another is possible.

Synthetic sand

A231.."Synthetic Molding Sand: Methods and Purposes of Its Application in Iron and Steel Foundries," H. Gries and W. Trommer, *Giesserei*, Vol. 39, No. 14, July 10, 1952. (In German)

Only those mixtures are to be recognized as synthetic molding sand which are made up of clay-free quartz-sand, binding media, and water. Synthetic molding sand has proper core quality, high refractoriness, and low distention besides being free of clay. Improvements in the use of bentonite-bound sand will enable the foundries to cast pieces of larger dimensions than heretofore has been possible with technical and economic advantage in green sand. Synthetic molding sand processes are more economical.

Hot blast cupola

A232.."The Hot Blast Cupola," Morris Itzel, *Gjuteriet*, Vol. 42, No. 3, March 1952, pp. 35-42. (In Swedish)

The author analyzes the theory underlying the operation of hot blast cupolas and traces the history of the development of hot blast cupola practice. He points out some of the merits and demerits of the hot blast cupola practice as compared with the ordinary cold blast process. The former practice is held to be more economical and more conducive to efficiency, even though it entails a greater initial investment than the latter. The article contains also a review of the most common current designs of hot blast cupolas as found in Europe.

High-frequency core baking

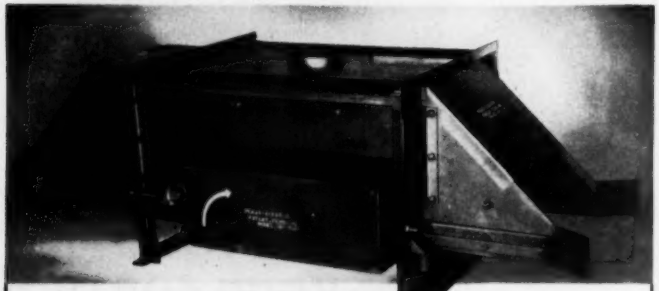
A233.."High-Frequency Drying of Cores Through Capacitative Heating," H. Derlon and C. Rauh, *Giesserei*, Vol. 39, No. 8, April 17, 1952, pp. 179-181. (In German)

In the case of cores, the hardening of which depends upon the withdrawal of water, high-frequency drying offers considerable advantage as compared with furnace drying. Among the most evident advantages are the saving of time and the simplicity and cleanliness of the process. Economy is also an attribute of this method.

Metal structure study

A234.."Develop New Technique for Metal Structure study," R. B. Pond and N. K. Chen, *Iron Age*, Vol. 170, No. 6, August 7, 1952, pp. 122-126.

Johns Hopkins University has developed a micro-motion method of studying transformations in metals. A motion picture camera is used to record the transformation as it proceeds. Using such an apparatus, solidification of low-melting pure metals and eutectic alloys



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Think what this means in terms of actual dollars and cents saved on otherwise lost production! Then, note this: the original cost of the PEKAY AIRATOR is *considerably less installed*—installation by your own personnel takes normally only about 25 man-hours! But that's not all: even when worn blades must finally be replaced, the job is usually done in *2 hours*—and without a cutting-torch!

If you want easy-flowing, cool sand without protracted interruption, at lower cost, you can get it with the PEKAY AIRATOR—already giving excellent results in heavy-duty foundry operation.

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has been photographed. With a micro-tensile tester, strain gages, and a Dynalog recorder, the plastic deformation of high purity aluminum crystals has been studied. Typical photographs are included.

Desulphurizing pig iron

A235.."Consideration of Some Methods of Desulphurizing Pig Iron," Albert De Sy, *La Fonderie Belge*, No. 5, May 1952, pp. 88-96. (In French)

An outline is given of both the conventional and the new procedures for desulphurizing pig iron. Among the former, (1) the addition of Mg (or other metals) is mentioned, resulting in the formation of insoluble sulfides, and (2) the partial transfer of FeS into a solution in a slag, the yield in both cases being limited by the reversible nature of the processes involved.

Among the newer methods, a brief description is made of (1) the desulphurizing with calcium carbide by the injection procedure of Wood et al. (Trans. A.I.M.E. 140:87, 1940), improved recently by Baumer et al. (*Journal of Metals*, April 1951), (2) the desulphurizing with pulverized lime and coke, both in rotating furnaces (Kalling et al. *Journal of Metals*, p. 732, Sept. 1951) and in stationary furnaces, according to an account given by Fornander (*Journal of Metals*, 739, Sept. 1951).

Steel sands

A236.."The Application of Synthetic Sands, Including Cement Sands," E. Lange, *Giesserei*, Vol. 39, No. 16, August 7, 1952, pp. 387-389. (In German)

The use of fully synthetic sands, including cement sands, for the making of steel castings has various economic advantages. Factors to be considered when using synthetic green sands include grain size, the binders used, and the basic preparation; the water and cement contents of the mixture strongly influence the properties of the sand. In spite of the progress made in research and experimentation with synthetic molding sands, many obstacles still must be overcome.

Gray iron properties

A237.."Correlation Between Analysis and Certain Properties in Ordinary Gray Cast Iron," Jörgen Drachmann, *Gjuteriet*, Vol. 42, No. 7, July 1952, pp. 108-114. (In Swedish)

Results of scientific and practical value can be obtained by using daily test results treated statistically. The author uses the influence of carbon, silicon, manganese and sulphur on machineability, Brinell hardness and chill depth in ordinary gray cast iron with a phosphorous content of about 0.60 per cent. Linear as well as quadratic approximations were used.

Variations of machineability and Brinell hardness with the carbon and silicon content of the iron are equally well described as variations of said properties with the carbon content. As regards machineability, this applies at least to a linear approximation. The chill depth has a minimum at 2.70 per cent Si. Machineability is influenced considerably by the manganese-sulphur ratio.

Magnesium melting furnace

A238.."A Casting Process with Systematic Frequency-Induction Crucible Furnace for the Melting of Magnesium Alloys," W. Zschintzsch, *Giesserei*, Vol. 39, No. 16, August 7, 1952, pp. 381-387. (In German)

Replacing the heretofore applied systematic frequency-induction chute furnaces, a crucible furnace very suitable for the melting of magnesium and aluminum has been developed which does not feature the chute. These furnaces permit easy control of the agitation of the bath, and operate more effectively and economically. They occupy less space, need smaller foundations, and feature a simple but reliable and quick adjustment and control of the supply of energy and, hence, the temperature.

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Practical combustion

Combustion Handbook . . 322 pp. Well illustrated. Published by North American Mfg. Co., 4455 E. 71st St., Cleveland 5. $2.00 plus postage. (1952)

Basic reference on industrial heating with gaseous and liquid fuels includes 178 tables, charts, and illustrations. It contains a glossary of terms used in the combustion industry and over 3000 entries in its index. It provides a basic explanation of the theory of combustion; outlines combustion, heat transfer, and fluid flow calculations; contains charts and data to simplify these calculations; and discusses selection and operation of combustion equipment.

Furnaces

The Science of Flames and Furnaces . . M. W. Thring. 416 pp. Illustrated with drawings. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $6.50 (1952)

Written in text-book form by a British author, scope of this book is best shown by its main divisions. These include furnace function; thermodynamics of furnace heating; liberation of heat by combustion; heat transfer; aerodynamics of hot systems; science of furnace construction; and applying scientific methods to furnaces. Contents are summarized from time to time, and include tables of conversion factors.

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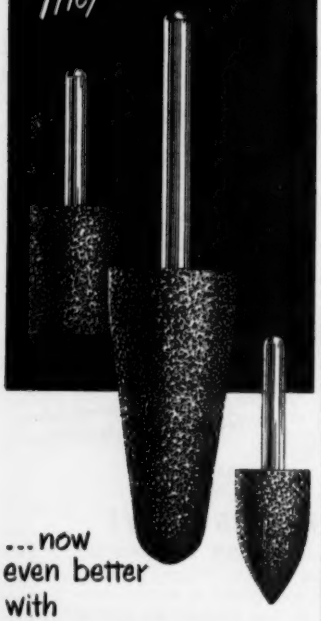

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convention

continued from page 41

ticipation in the shop course meetings; sessions on gray iron and sand are planned for the evenings of Monday, Tuesday, and Thursday, May 4, 5, and 7.

Six round table luncheons—light metals, brass and bronze, gray iron, steel, malleable iron, and pattern—will be held during the 1953 A.F.S. Annual Convention. Like the shop courses, the luncheons are informal, practical discussions in which everyone is privileged to share.

Such traditional events as the Annual Banquet, the Canadian Dinner, the Educational Dinner, the Past Presidents' Breakfast, and the A.F.S. Alumni Dinner are concentrated during the three middle days of the Convention to accommodate the greatest possible number of attendants.

The Annual Banquet, with presentation of Gold Medals and Honorary Life Memberships, will be Wednesday evening, May 6. On the following day President I. R. Wagner, Electric Steel Castings Co., Indianapolis, will preside at the Annual Meeting featuring the Presidential Address, election of officers and directors, and presentation of apprentice awards. The Charles Edgar Hoyt Annual Lecture will follow the business meeting.

A complete program for the ladies starting with the A.F.S. Tea, at which the Society plays host, will run throughout Convention week.

▶ *Rammed up and poured*

Foundryman's Prayer

Now I lay me down to sleep.
I pray the Lord my sand will keep.
Let no other molder take
My slick and trowel before I wake.
And Lord, if I should die tonight,
Don't make me lie alone;
Just lay me out in a core box
So I will feel at home.
No flowers for me, I'll look my best
With a ten inch riser on my chest
Dressed in work clothes clean and neat
With gaggers at my head and feet.
Bury me in an iron flask
With facing all around;
Fill it up with heap sand
And plant it in the ground.
And this I ask, don't take my soul
To Heaven; because—well
I told the boys down at the shop
That I'd see them all in Hell. *Amen.*

From the book *Rammed Up and Poured*, by Bill Watkins, copyrighted by the Electric Steel Foundry Co.

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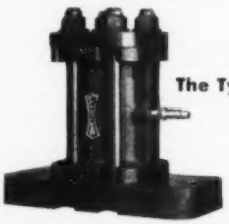

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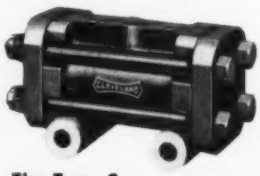

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foundry tradenews

Sipi Metals Corp., has been adopted as the new name of Silverstein & Pinsof, Inc., Chicago smelters and refiners. The firm which was founded in 1912 produces non-ferrous alloys and is a warehouse distributor of Reynolds aluminum ingots. Early in its development, the company set up a complete laboratory for analytical research and quality control; all resulting discoveries, methods and procedures are made available to industry, laboratories, and schools.

Chain Belt Co., Milwaukee, has announced the appointment of Beaty Machine Works, Keokuk, Iowa, as distributor for merchandise products of the chain and transmission division, conveyor & process equipment, and Baldwin-Duckworth Div. of the company.

Battelle Memorial Institute, Columbus, Ohio, recently broke ground for a million-dollar "special purpose" laboratory building. Construction was authorized by NPA because of the important defense research being conducted at Battelle. The new building will be of specially reinforced-concrete construction designed to minimize vibration. This special feature was incorporated in the design, because plans call for the building to be occupied by research personnel working in electronics and other fields of research where delicate measurements are essential. The four-story brick and concrete structure will provide 80,000 sq ft of work area in 187 unit laboratories.

Mir-O-Col Alloy Co., Inc., Los Angeles, has erected a new foundry in a move to expand its present production of precision steel and alloy castings. New equipment installed include a 50 KVA induction furnace fitted with 100 and 200 lb crucibles, and two gas kilns used to preheat the molds prior to their pouring. The foundry employs the hot ceramic mold technique. Currently the foundry is pouring castings ranging from one to twenty-five lbs in weight.

New Britain Machine Co., New Britain, Conn., is now producing in America the copying lathe designed and first introduced in Europe by **George Fisher Ltd.,** Schaffhausen, Switzerland. New Britain has preserved all the important features of this contour lathe, adapting it to the requirements of American industry.

Northrop Aircraft, Inc., Hawthorne, Calif., and **Aluminum Co. of America,** have produced a 16 ft long cast magnesium aircraft wing believed to be the largest aircraft surface ever produced by the casting process. The part was produced through the joint efforts of aeronautical and metallurgical engineers of the two companies but was actually cast at Alcoa's Vernon, Calif. foundry. Cast to exacting tolerances, the wing section is only a quarter of an inch thick in places, conforms to aircraft quality standards, and is said to be free of visible porosity or other defects. Foundry techniques employed were not disclosed. John K. Northrop, president of the aircraft firm, warned that much additional experimentation and testing must occur before this method of manufacture is ready for quantity production. It is widely believed that wings can be produced much more rapidly and economically by casting than by the conventional method of riveting or spot-welding aluminum skins to spars and ribs.

Kelley-Koett, Covington, Ky., has incorporated its trade-name into its business name. The company explains that the new name, **Keleket X-Ray Corp.,** was adopted because it is more informative and descriptive of the nature of the corporation's business. Keleket is now affiliated with **Tracerlab** in order to bring their combined resources to the field of radiology.

H. K. Ferguson Co., Cleveland, engineers and builders, has added a special foundry division to its organization. The new division is headed by Oliver D. Conover who headed the firm of engineers under his name since 1932. The merging of the two firms was a move to create a working combination that can offer a broad range of services to the foundry field.

International Minerals & Chemical Corp., New York, in its annual report for the fiscal year just ended stated that net earnings showed an increase of 2 per cent over the previous year. Earnings before income taxes were $9,678,251 compared with $9,639,130 for the previous year. A letter to stockholders accompanying the report explained: "Sales of the corporation's products continue to show satisfactory increases over previous years. However, operating margins were narrowed by increases in costs without advances in product prices."

American Silica Sand Co., Ottawa, Ill., has been named sole distributor to the foundry industry of the Rajon car unloader. Recently made available to the industry on a nation-wide basis, the unloader comes in two models used for unloading granular or lump material from gondola or box cars.

Cleco Div., Reed Roller Bit Co., Houston, Texas, has appointed Oliver H. Van Horn Co., New Orleans, La., Bethlehem Supply Company, Inc., Bethlehem, Pa., and Peerless Supply Co., Inc., Shreveport, La., as distributors for Cleco products in their areas.

Foundry Apprenticeship Display at 1952 Wisconsin State Fair, prepared by Nordberg Manufacturing Co., Milwaukee, shows what the industry is doing to offer organized training opportunities to youth on an apprenticeship basis. Included in the display was a description of the training program and the complete set of foundry tools that an apprentice is taught to use during training course. Harry Esser, Nordberg apprentice supervisor, tended the display.

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Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

committee news

continued from page 99

tatively scheduled papers on aluminum, on permanent molding, on rare earth-magnesium alloys, and several on titanium.

Members of the newly formed Shell Molding Committee are F. P. Strieter, Dow Chemical Co., Midland, Mich., chairman; J. A. Fulwider, Fabricast Div., General Motors Corp., Bedford, Ind.; Harry W. Dietert, Harry W. Dietert Co., Detroit; George R. Gardner, Aluminum Company of America, Cleveland; and J. L. Schmieder, Jr., Oberdorfer Foundries, Inc., Syracuse, N. Y.

Participating in the Executive Committee meeting were: Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, *chairman;* Manley E. Brooks, Dow Chemical Co., Midland, Mich., *vice-chairman;* Robert F. Thomson, General Motors Corp., Detroit, *secretary;* Walter Bonsack, Christiansen Corp., Chicago; Donald L. Colwell, Apex Smelting Co., Chicago; Harry W. Dietert, Harry W. Dietert Co., Detroit; J. H. Jackson, Battelle Memorial Institute, Columbus, Ohio; W. A. Mader, Oberdorfer Foundries, Syracuse, N. Y.; S. C. Massari, A.F.S. technical director; C. E. Nelson, Dow Chemical Co., Midland, Mich; H. J. Rowe, Aluminum Co. of America, Pittsburgh, Pa.; Walter E. Sicha, Aluminum Company of America, Cleveland; T. D. Stay, Reynolds Metals Co., Louisville, Ky.; and A. W. Stolzenburg, Aluminum Company of America, Detroit.

Refractories

Status of the *Refractories Manual* and the refractories sessions of the 1953 Convention were discussed at a meeting of the Refractories Committee, September 15, Chicago. Material for several chapters of the manual is now ready and other write-ups are coming in the committee learned.

Paper possibilities for next year's convention were divided into those related to refractories as applied in various branches of the industry. In the non-ferrous field, possible papers are *"Indirect-arc Furnace Refractories"* and *"Use and Abuse of Crucibles."* Gray iron papers which may become available cover *"Air Placement of Siliceous Cupola Linings,"* and *"Carbon Refractories for the Foundry."* In the malleable field, the committee discussed papers on *"Air Furnace Duplexing Refractories,"* and *"Refractory Life in Batch-Type Furnaces."* Both papers suggested in steel refractories relate to electric furnace roofs. General interest papers which may become available cover characteristics of fire clay brick and of foundry ladle refractories.

Members of the committee who met under the chairmanship of Walter R. Jaeschke, Whiting Corp., Harvey, Ill., included: Ray A. Witschey, A. P. Green

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Sand program and papers

Meeting to plan for the Sand Division's part in the 1953 A.F.S. Convention, the Program & Papers Committee arranged for participation in a Symposium on Sand Reclamation and for several additional sessions. The meeting was held at A.F.S. Headquarters, September 5, and included representatives of the Gray Iron and Steel Divisions. Following receipt of papers submitted for the Convention, which must be in the hands of the committee by December 15, the group will meet January 9 to go over the final program.

The Symposium on Sand Reclamation will be held in two sessions on Wednesday, May 6, starting at 10:00 a.m. and 2:00 p.m. At the first session papers scheduled are *"Development of Sand Reclamation," "Dry Reclamation of Steel Sand,"* and *"Wet Reclamation of Steel Sand."* At the afternoon session, two papers on wet reclamation using two different types of equipment will be presented. Papers to be presented during the symposium cover all foundry sand reclamation equipment types currently in operation on which service data are available.

Convention committee reports planned by the Sand Division cover veining tests, flowability, deformation, mold surface reactions, standard test patterns, and sand grain distribution. In addition, the division is planning a paper on shell molding and another on prevention of sand segregation in storage. Sand Shop Course sessions will be held again this year as in the past but specific subjects have not as yet been assigned.

Presiding at the meeting was Frank S. Brewster, Harry W. Dietert Co., Detroit, Program & Papers chairman. Committee members present included: J. B. Caine, consultant, Cincinnati; F. P. Goettman, Standard Sand Co., Grand Haven, Mich.; Joseph S. Schumacher, Hill & Griffith Co., Cincinnati; C. C. Sigerfoos, Michigan State College; Elmer C. Zirzow, Werner G. Smith, Inc., Cleveland; and Clyde A. Sanders, American Colloid Co., Chicago, chairman of the Sand Division. Representing the Gray Iron Division at the meeting was its chairman, W. W. Levi, Lynchburg Foundry Co., Radford, Va.; H. H. Blosjo, vice-chairman, Steel Division Program and Papers Committee of Minneapolis Electric Steel Castings Co., Minneapolis, represented the Steel Division. Also present were S. C. Massari, and Joseph E. Foster.

The first meeting of the Sub-Committee on Mulling Techniques of the Green Sand Properties Committee was held September 3 at Griffin Wheel Co., Chicago. Karl J. Jacobson of Griffin Wheel, presided.

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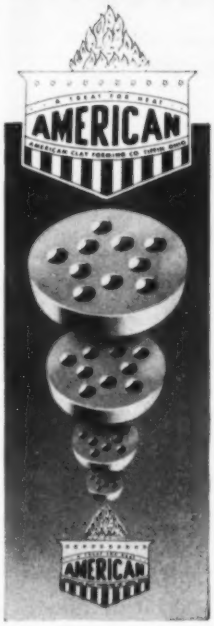

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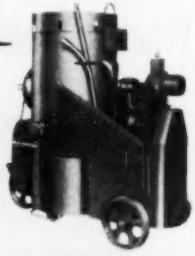

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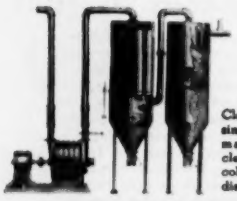

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coming events

October

15 . . Non-Ferrous Founders' Society
Beck's, Philadelphia. C. A. Sanders, American Colloid Co., Chicago. *"How to Get the Most Out of Naturally Bonded Sands."*

16-17 . . Gray Iron Founders' Society
Hotel Cleveland, Cleveland. Annual Meet.

16-18 . . Foundry Equipment Manufacturer's Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

17 . . Texas
Marshall. Dinner. M. L. Young, U. S. Gypsum Co., Chicago. *"Use of Gypsum Plaster in Pattern Making."*

17 . . Tennessee
Patten Hotel, Chattanooga, Tenn. William Rose, Borden Co., Chemical Div., New York, *"Shell Molding."*

17-18 . . Michigan Regional Foundry Conference
University of Michigan, Ann Arbor. Sponsored by A.F.S. Central Michigan, Western Michigan, Detroit and Saginaw Valley Chapters and A.F.S. Michigan State and U. of Michigan Student Chapters.

20 . . Quad City
Fort Armstrong Hotel, Rock Island, Ill. James Mathias, Accurate Match Plate Co., Chicago. *"New Developments in Pattern Practice."*

20-23 . . Society for Non-Destructive Testing
Hotel Sylvania, Philadelphia. 12th Annual Meeting.

20-24 . . American Society for Metals
Philadelphia National Metal Congress and Exposition.

21 . . Eastern New York
Circle Inn, Latham, N. Y. John Holt, Basic Refractories, Inc., Gary, Ind. *"Basic Refractories."*

22 . . Mo-Kan
Fairfax Airport. Martin Fladoes, Sibyer Steel Casting Co., Milwaukee. *"Steel Casting Defects."*

24 . . Chesapeake
Engineering Club, Baltimore, Robert A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J. *"Brass and Bronze Foundry Practice."*

24 . . Malleable Founders' Society
The Drake, Chicago. Western Sectional Meeting.

24-25 . . Northwest Regional Fdy. Conf.
Multnomah Hotel, Portland, Oregon. Sponsored by the Oregon, Washington, and British Columbia Chapters and the Oregon State College Student Chapter of A.F.S.

24-25 . . New England Regional Fdy. Conf.
Massachusetts Institute of Technology, Cambridge. Sponsored by New England Foundrymen's Assn. and M.I.T.

27 . . Northwestern Pennsylvania
Moose Club, Erie, Pa., L. D. Richardson Eutectic Welding Alloys Corp. "*Welding as Related to the Foundry Industry.*"

30-31 . . Metals Casting Conference
Purdue University, West Lafayette, Ind. Sponsored by the Central Indiana and Michiana Chapters and Purdue University.

31 . . Ontario
Royal York Hotel, Toronto. Ferrous and non-ferrous group meetings. "*Cleaning Castings.*"

31 . . Metropolitan Brass Founders
Hotel New Yorker, N. Y. 42d Anniversary Show and Dance.

November

3 . . Central Illinois
American Legion Hall, Peoria, Ill. Guy A. Pealer, General Electric Co., Elmira, N. Y. "*Pattern Engineering & Coordination of Methods to Produce Better Castings.*"

3 . . Chicago
Chicago Bar Association. "*The 3 P's of Ductile Iron.*"

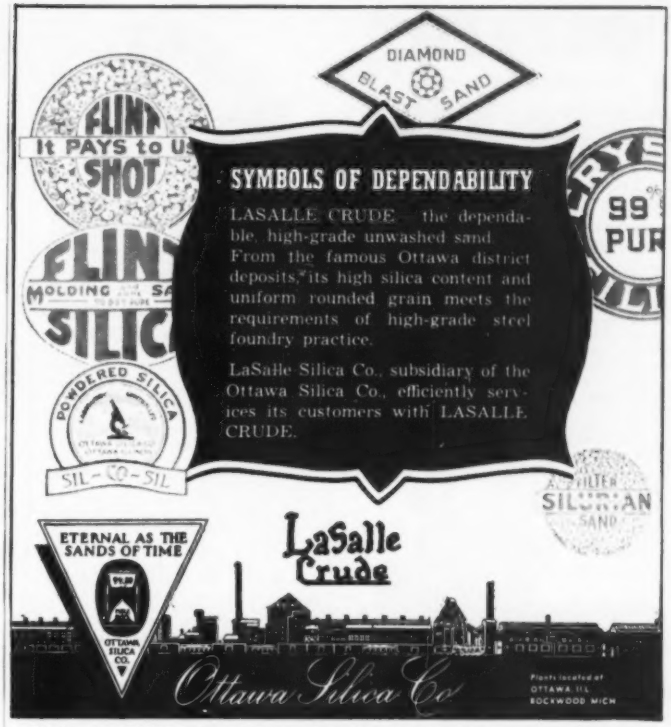
3 . . Western Michigan
Bill Stern's Steak House, Muskegon, Mich. S. C. Massari, A.F.S. National Office. "*Effect of Gating Design on Casting Quality.*"

6 . . Saginaw Valley
Frankenmuth, Mich. "*Steel, Ferrous, and Non-ferrous Castings.*"

6 . . Canton District
Mergus Restaurant, Canton, Ohio. C. E. Westover, Westover Engineers, Milwaukee. "*Mechanization for Small Foundries.*"

6-8 . . All Canadian Fdy. Conference
Mount Royal Hotel, Montreal, Quebec. Sponsored by A.F.S. Eastern Canada and Ontario Chapters.

7 . . Malleable Founders' Society
Hotel Commodore, New York. Eastern Sectional Meeting.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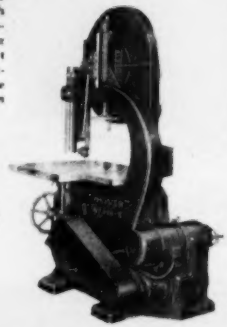

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11 . . Rochester
Seneca Hotel, Rochester, N. Y. Speaker from Claude B. Schneible Co., Detroit. *"Foundry Equipment and Dust Control."*

11 . . N. Illinois-S. Wisconsin
Beloit Country Club, Beloit, Wis. Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala. *"Basic Lined Cupola."*

13 . . St. Louis District
York Hotel, St. Louis. Lee Everett, Lester B. Knight & Assoc., Inc., Chicago. *"Foundry Mechanization."*

13-14 . . Southwest Regional Fdy. Conf.
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14 . . Philadelphia
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17 . . Quad City
Fort Armstrong Hotel, Rock Island, Ill. Thomas E. Eagan, Cooper-Bessemer, Corp., Grove City, Pa. *"Practical Aspects of Nodular Iron."*

18 . . Eastern New York
Circle Inn, Latham, N. Y., Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemicals Corp., Chicago. *"Cupola Operations & Basic Cupolas."*

19 . . Oregon
Heathman Hotel, H. K. Salzberg, Borden Co., New York, *"Shell Molding."*

19 . . American Standards Association
Waldorf-Astoria Hotel, New York. Annual Meeting.

19 . . Central Michigan
Hart Hotel, Battle Creek, Mich. Film, *"The Invisible Shield."* Talk by freshman coach Michigan State College.

20 . . Penn State
Penn State College, foundry classroom. E. C. Troy, Consultant, Palmyra, N. J.

20-21 . . American Society for Quality Control

Claypool Hotel, Indianapolis, Indiana. Seventh Midwest Conference.

21 . . Ontario

Prince Edward Hotel, Windsor, Ont. Guy A. Pealer, General Electric Co., Elmira, N. Y., *"Methods to Produce Better Castings."*

December

4-6 . . American Institute of Mining and Metallurgical Engineers

William Penn Hotel, Pittsburgh, Pa. Electric Furnace Steel Conference.

1953

January

15-16 . . Safety Training Course

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February

6-7 . . California Regional Fdy. Conf.

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12-13 . . Wisconsin Regional Fdy. Conf.

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19-20 . . Southeastern Regional Conf.

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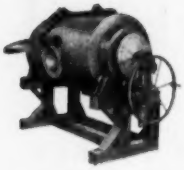

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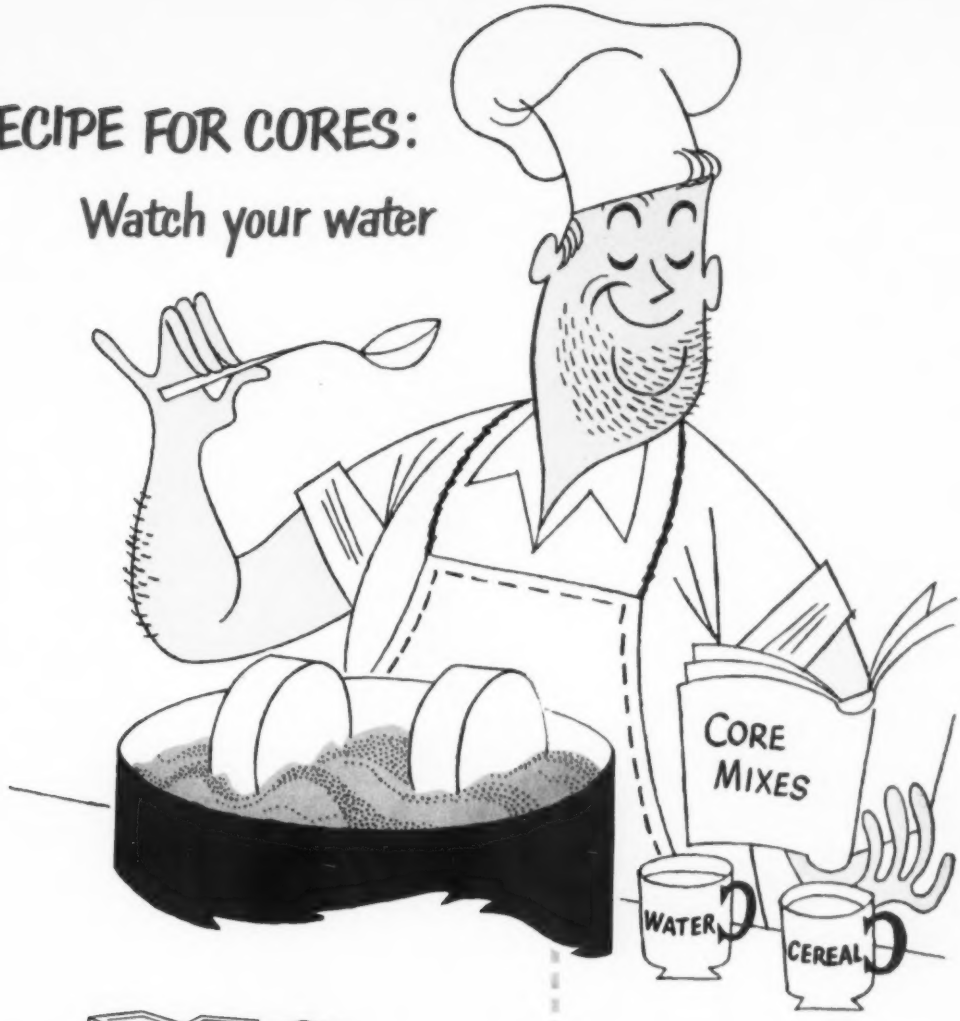

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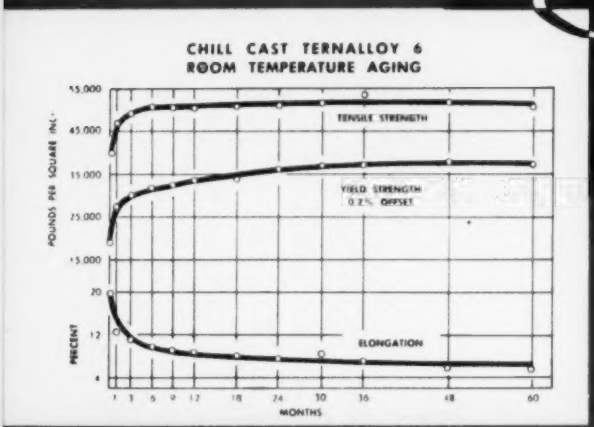

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